May-June 1954

SIGNAL

Communications—Electronics—Photography

AFCA's New President — George W. Bailey

a helpful guide to relay and stepping switch selection

1. when first cost is important . . .

You can hold down costs with this "all-purpose" relay. Meets Automatic Electric's high quality standards—gives long, dependable service. For dc operation only.

Class "A" Relay

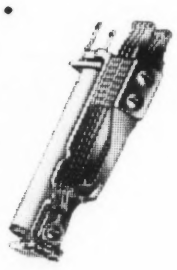
2. for outstanding endurance, dependability . . .

When extremes in long service life and reliable operation are demanded, this relay meets requirements. Life often exceeds 400 million operations! For ac or dc operation.

Class "B" Relay

3. when size limits relay selection . . .

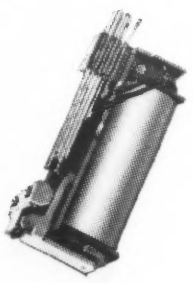
This compact relay combines unusual dependability and surprisingly long service-life in a space about half the size of the average relay of equal rating. For dc operation only.



Class "C" Relay

4. for alternating current only . . .

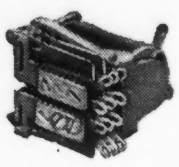
Here's a relay for use where ac is the only power source—where operate or release time delays are not a factor—where low power consumption is a *must*. For ac operation only.



Class "F" Relay

5. for exacting miniature applications . . .

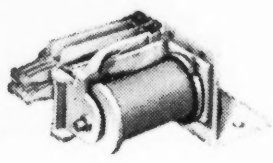
For aircraft use where resistance to shock and vibration must be met by a small, light relay. Rugged, reliable. For dc operation only.



Class "S" Relay

6. for maximum timing with reduced size . . .

You can order this miniature relay with specific time-delays, plus many other special features. For ac or dc operation. Time-delay is for dc operation only.



Class "Z" Relay

Rotary stepping switch features . . .

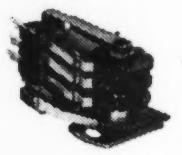
For complicated space and weight problems, specify Type 44. By proper wiper arrangement, this sturdy switch can provide 10-, 20-, or 30-point operation. For up to 110 V. dc, or built-in rectifier for 115 V.-60 cycles.

Use Type 45 for greater capacity. Available with 2 to 10 (or more) 25-point bank levels. Can be used with wipers arranged independently for 25-point operation; or in staggered pairs for 50-point operation. For up to 110 V. dc, or for 115 V. ac.

send for:
Relay Circular 1702.
Stepping Switch Circular 1698.

7. to combine relay and stepping switch functions . . .

Here's a shock-resistant, cam-type relay for cam-switching, alternate on-off operations. Use as a "stepper." *You* specify programming. For dc, or 115 V.-60 cycles ac rectifier operation.



Series "OCS" Relay

8. special features available . . .

For applications where atmospheric conditions will affect relay performance, all Automatic Electric relays are available in hermetically-sealed enclosures. Special plug-mountings may also be specified for Class A, B, F, S and Z Relays.

Class "S" Relay

Automatic Electric's high standards of quality, workmanship and engineering offer you the finest relays and stepping switches money can buy, in a complete selection to fit your needs. *Write today for complete information. Automatic Electric Sales Corporation, 1033 West Van Buren Street, Chicago 7, Illinois.*

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Instead of paying 25% on Long Distance calls, you now pay 10%. On Local telephone service, the tax is now 10% instead of 15%.

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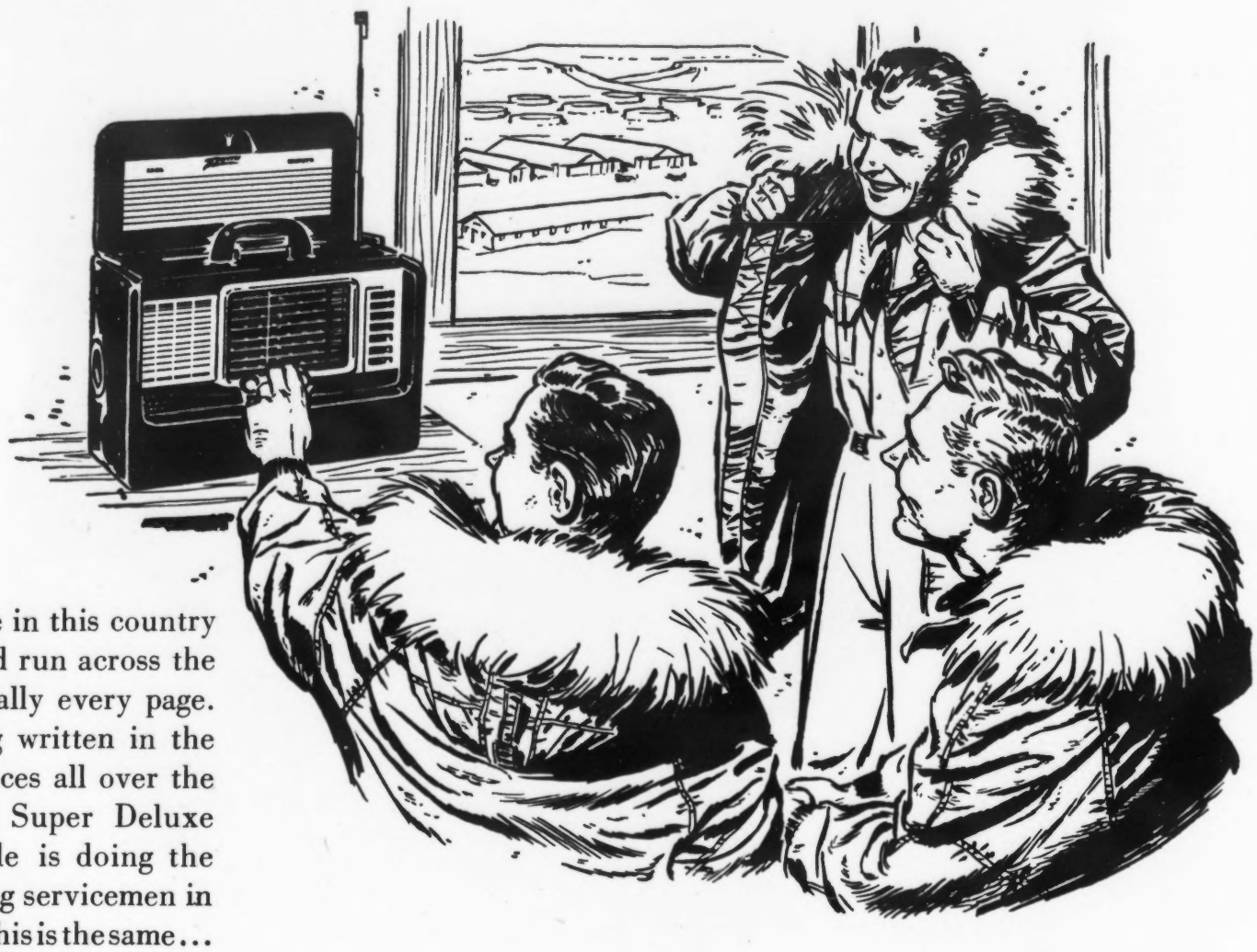
Now it costs you even less to keep in touch by telephone.

BELL TELEPHONE SYSTEM

A Brief History of Shortwave

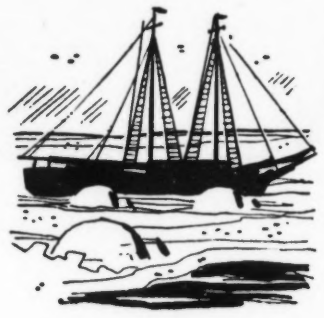
(It's amazing how much of it has been written by Zenith)



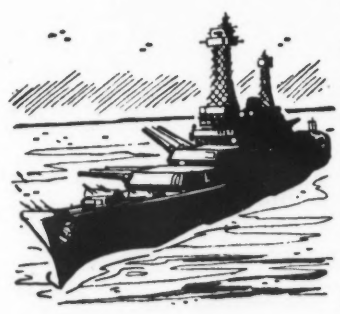
If the history of shortwave in this country were put into a book, you'd run across the name of Zenith on practically every page. The latest chapter is being written in the outposts of the U. S. Services all over the world. There, the Zenith Super Deluxe TRANS-OCEANIC portable is doing the valiant morale job of keeping servicemen in constant touch with home. This is the same...

(2) famous Zenith shortwave that has been carried by diplomats, explorers, world celebrities on missions all over the globe. Its list of owners reads like Who's Who. For 13 years it has worked faithfully under very extreme conditions of cold and tropic humidity . . . on ships, trains and planes. The original...

(3) Zenith TRANS-OCEANIC portable introduced just before World War II, was the realization of Zenith Commander McDonald's insistence on a practical portable that would handle shortwave as easily as standard broadcast. It took Zenith's engineers over two years to develop such a set and . . .



(4) the production of the now famous Zenith TRANS-OCEANIC portable was begun in 1941. This was only after Commander Donald B. MacMillan, noted Arctic explorer, reported from off the coast of Greenland that never had a radio worked so well under arctic conditions as the battery operated shortwave set Zenith had supplied him. Even more dramatic . . .



(5) was the year in the early 20's when Commander McDonald persuaded the Navy, bound for exercises off the coast of Australia, to take along a shortwave transmitter and receiver aboard the battleship "Seattle." When all standard radio failed, this equipment maintained direct contact with the U. S. That was the turning point in the Government's recognition of shortwave.

Zenith leadership in the development of shortwave has resulted from 35 years of devotion to engineering and manufacturing radionics products exclusively. The know-how born of this experience has been at the constant service of the Government . . . as, for instance, in the manufacture of the proximity fuses which played a major role in World War II.

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SIGNAL

Communications-Electronics-Photography

Journal of the Armed Forces Communications Association

VOLUME 8 **MAY-JUNE 1954** **NUMBER 5**

FEATURES

DEPARTMENTS

Authors are entirely responsible for opinions expressed in articles appearing in AFCA publications, and these opinions are not to be construed as official or reflecting the views of the Armed Forces Communications Association.

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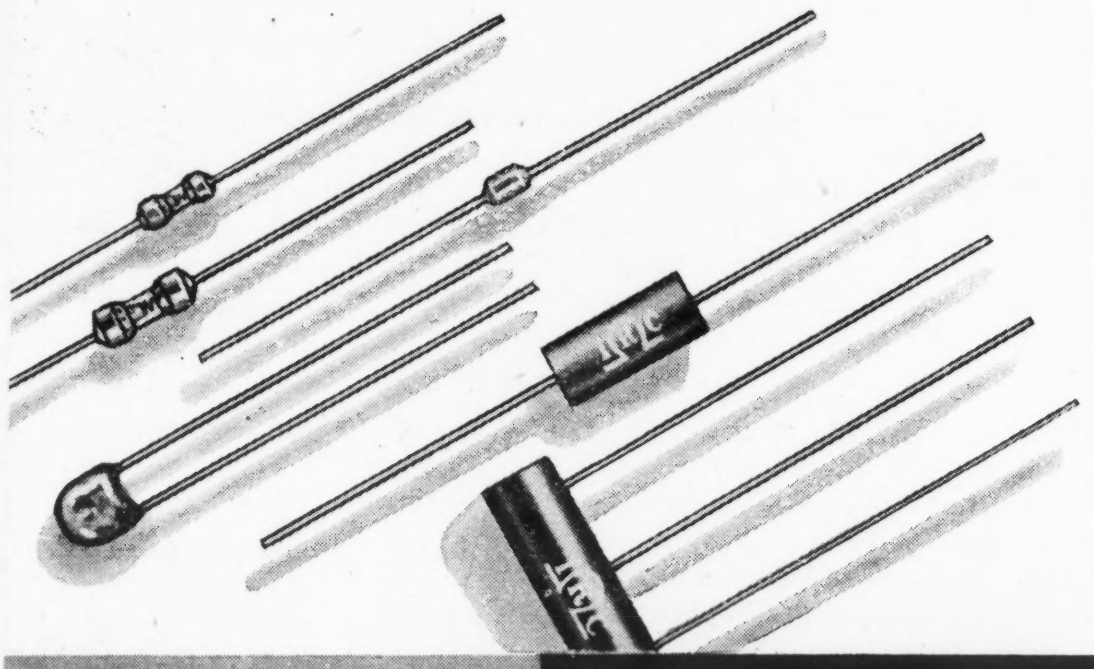
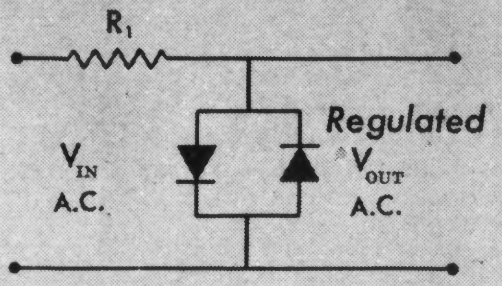
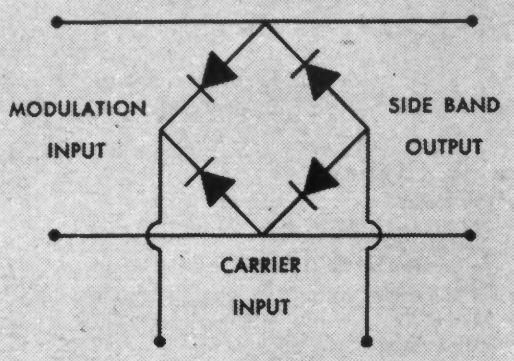


TYPICAL ADVANCED APPLICATIONS

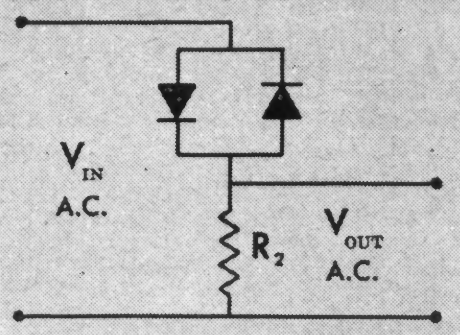
VOLTAGE REGULATION



BALANCED MODULATOR



LOGARITHMIC CONVERTERS



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RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DIVISION **CAMDEN, N.J.**

Memo to SIGNAL Readers:

As I travel about the country, visiting new chapters and groups that are working toward organizing chapters, I am often asked, "What is the AFCA, what are its objectives, who are its members and why should I join?"

Well, those questions are not at all hard to answer, and the first two are answered quite satisfactorily in our Invitation to Membership. Let me quote from the Invitation, regarding the AFCA and its objectives:

"The Association was founded in May 1946, incorporated under the laws of the District of Columbia and was established as a result of the experiences of the communications, electronic and photographic services in the Armed Forces in World War II and those who served with them from civilian life. Its organizers envisioned a strong body of American citizens, both Industrial and Armed Service, which through the combined efforts of its members would make certain of the security and preparedness of our United States.

"The Association endeavors to maintain and improve the cooperation between the Armed Forces and Industry in the design,production, maintenance and operation of communications, electronic and photographic equipment in time of peace as well as in time of war, and to preserve and foster the spirit of fellowship among former, present and future service and industrial personnel in this field."

Membership in the AFCA is open to American industrial organizations, to members of the Armed Services, and to all men and women (civilian or military) who are American citizens and who are interested in furthering the objectives of the Assocication.

Then, some of the reasons for becoming a member:

"1. Membership in a national non-profit, nonsectarian, non-political association, whose aims are entirely patriotic and whose interests are in the communications-electronics-photography field.

"2. A chance to help stimulate and keep alive interest in a most vital phase of our national security . . . INDUSTRIAL PREPAREDNESS.

"3. Participation in the professional, technical, and social activities of the national association and its local chapters.

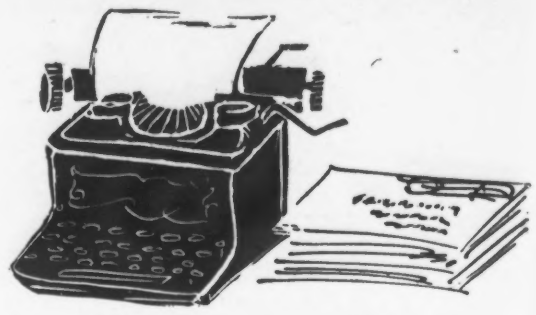
"4. As an AFCA chapter member, to meet and know leaders—both Industrial and Armed Service—in our communications-electronics-photography field.

"5. A subscription to SIGNAL, official journal of the Association.

"6. The Association monthly News Letter, published on the first day of every month, containing items of timely interest."

I believe the above are good, and in most cases, satisfactory answers. And always remember that when an individual becomes a member of a society such as the AFCA, what he puts into it rather than what he gets out of it is the real measure of his successful membership.

The Editor



Our Readers Write

Cover Photographer

Dear Sir:

On the cover of your March-April issue, you show a beautiful view of the U.S. Capitol. . . . Who "shot" this unusual picture?

WILLIAM A. WHITE
New York City

(Our cover photograph was made by Mr. Harry L. Burnett, Jr., an engineering aide at the Capitol. It was photographed from a perch atop the main building of the Library of Congress on May 26, 1952, just after the Capitol had received a fresh coat of paint. Our thanks to Mr. Burnett for producing a photo which has caused so much favorable comment about SIGNAL'S *cover. —Ed.)*

"I Remember" Girls

Dear Sir:

The copies of SIGNAL are deeply appreciated by the Signal Corps women now living in Seattle and they asked me to thank you, not only for the copies, but also for the very nice article. It is indeed nice to be remembered.

In spite of the fact that we are widely scattered, the Signal Corps Telephone Operators have, for the most part, kept in close touch during the past 35 years. We have around 150 present names and addresses of the original 223 women who were sent overesas.

One factor that has contributed to this close association has been our efforts to secure official recognition from Congress for our services. Although we were the first American women, other than nurses, to serve overseas in Army uniforms, we have never been granted military status. Numerous bills have been introduced into Congress (there were five in the 82nd, one by Senator Taft) but our number is so small that we have never succeeded in getting them out of committee.

But, regardless of recognition, our women are proud of the fact that they once wore the crossed flags of the Signal Corps. That we did a good job was undoubtedly the reason that the Women's Army Corps followed in our footsteps in World War II. At least that is what we like to think!

Thank you, SIGNAL, for remembering.

MRS. H. R. ANDERSON
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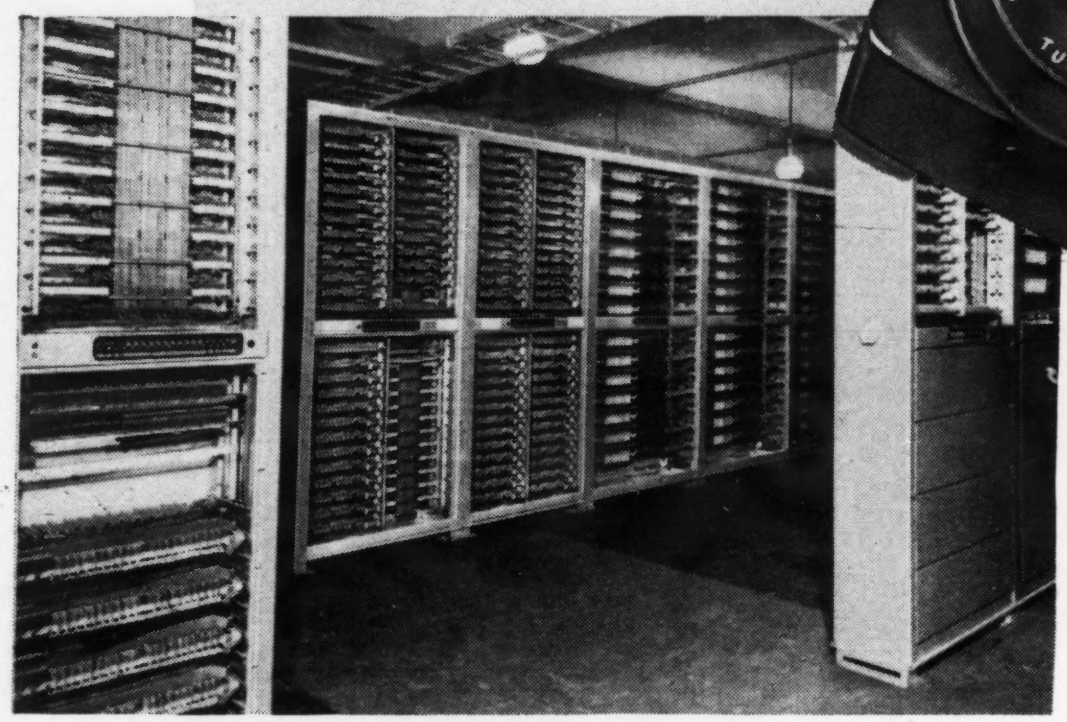
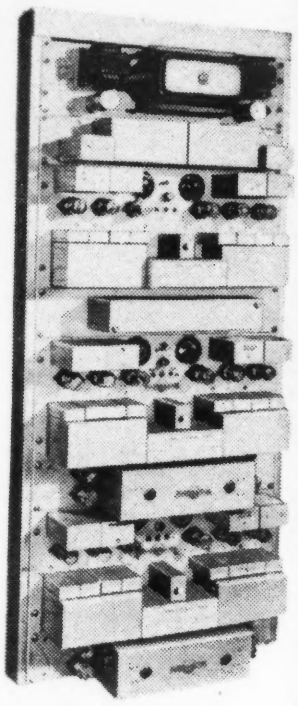
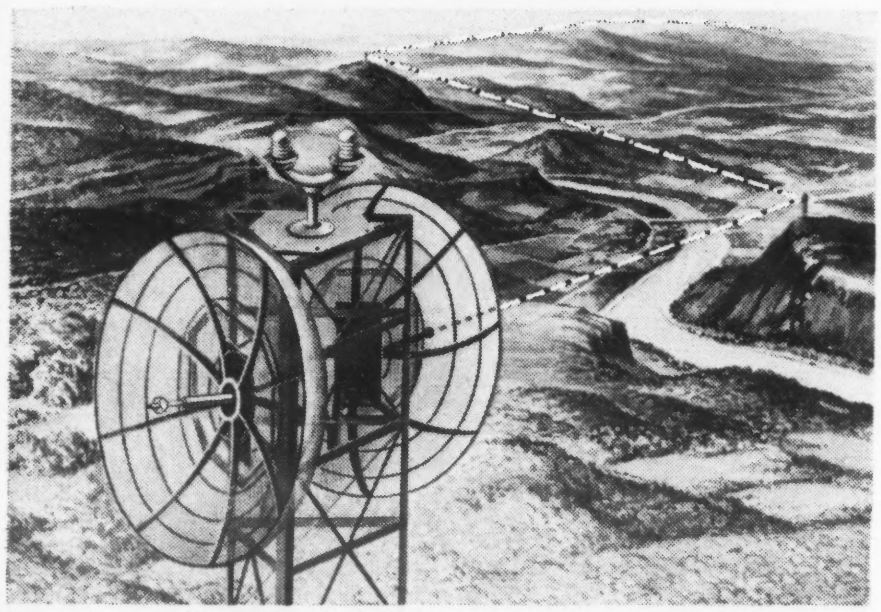


Typical of advanced design and performance in dial telephone switching systems is Kellogg Crossbar, developed by Kellogg Switchboard and Supply Company, a division of IT&T, for use in telephone exchanges. Together with Kellogg Relaymatic, as well as Step-by-Step and Rotary dial switching equipment made by Federal Telephone and Radio Company, also a division of IT&T, Kellogg provides a complete range of automatic switching systems as well as other equipment and supplies for the independent telephone industry.



Greater capacity for existing telephone lines is made possible by the compact and economical "carrier" system of telephone communications. Carrier can provide as many as 18 additional circuits, superimposed on existing lines without the necessity of stringing more wires. Short, medium and long-range types for voice as well as signal transmission are available. With the Kellogg Type No. 5 Carrier, shown at right, four simultaneous conversations may be carried on one wire circuit.



Microwave radio relay carries telephone circuits over mountains, rivers, deserts, lakes and other difficult terrain *without wire lines.* Between Bartow and Tampa, Fla., the Peninsular Telephone Co. has installed the first independent telephone company microwave link connecting with the nation-wide inter-toll dialing system. The complete equipment was designed by Federal Telecommunication Laboratories, research division of IT&T at Nutley, N. J.

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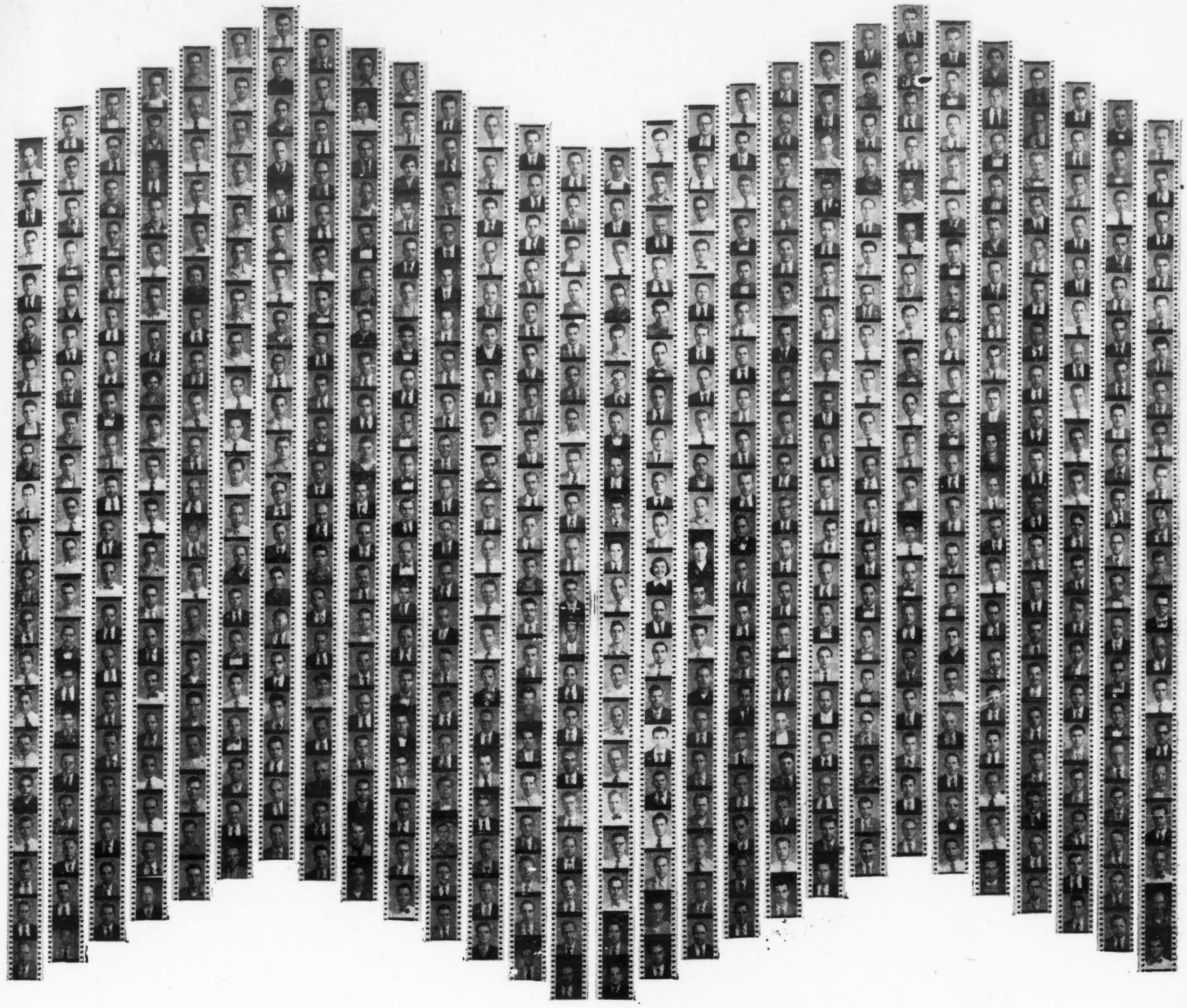

you are looking at 560 electronics engineers

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Considered Reconversion

or

Cankerous Recession

WHICH?

by Colonel Melvin G. Brown, USMC

NOT TOO LONG AGO A WIDELY READ BUSINESS MAGAZINE indicated that industrial production, by mid-1954, may be but four-fifths of 1953's peak. At such a level it would be just about where it was at the very top of the 1948 boom. To some people, that would still be a lot of business.

Even so, it would be a recession. At least it would be for industry, using the word industry in the narrower sense. Certainly it would be a movement backward for many of the reported 17-million manufacturing employees, 11 percent of our estimated total population.

Perhaps some of this expected movement backward could be chargeable to cancellation or stretching out of defense contracts. Such actions are part of the reconversion process. It appears to be that part of reconversion through which our economy is now passing.

While reconversion and recession are not necessarily synonymous, they can have something of the same connotation. However, for the sake of this discussion it may be assumed that *reconversion* means *to change from a state of defense mobilization back toward a former economic status without causing the type or degree of recession many people identify as a depression.*

That is the purpose of this paper, to discuss a reconversion that will not lead into such a marked recession. The discussion will be divided into two chief parts:

1. Reconversion from a situation comparable to that obtained during the active hostilities of World War II; and,
2. Reconversion from a situation resulting from a compounding of crises integrating into a cold war.

The premise of this paper should be understood prior to partaking of either part. Otherwise the discussion may prove pointless. The premise is simply that neither the frequency nor the amplitude of our economic cycles should be so great that our people will grasp for the sop of communism as a panacea for economic dizziness.

With that premise well in mind one may easily comprehend that the objectives, problems and procedures for any future reconversion should be included in mobilization studies. Only a tentative plan can be devised in this first, pre-emergency stage because it must be based on such variables as the extent of defense mobilization, geographical distribution of materials, dispersion of the military, concentration of the labor forces and post-emergency needs of the political, psychological and economic aspects of the conflict.

The second stage occurs during the emergency. This will be a period when flexibility should be the watchword. Just as military forces are shifted to meet new tactical demands, so should workers be shifted as the requirements for various weapons change. Toward the end of the second stage the pattern for action during the third, or post-emergency stage will probably become increasingly apparent.

The objectives studied during the first stage should not have changed. But, towards the end of the emergency those problems studied in the first stage actually needing to be solved in the post-emergency period should stand in basrelief at least. Moreover, the procedures to solve the problems should be decided.

This forward looking should neither be misconstrued as interference with private enterprise nor statist planning, for it ought to be remembered that unbridled profit-motivation hasn't always been to the advantage of the majority. Rather, this forward looking should be regarded as necessary to the maintenance of our dynamic economy.

An acceptable guide to reconversion, without immediate recession, from a situation comparable to that obtained during the active hostilities of World War II may be found by referring to the 1945-June 25, 1950 period. Past facts can be guide posts of the future, provided that they are properly weighed.

As in World War II, and because of such "of late" policies as governmental underwriting of expanding facilities in labor surplus areas, the emergency labor force may be concentrated geographically in accordance with particular industrial complexes. Even though some contrary efforts may be made to disperse industry, the necessity of emergency production *right now* and lack of adequate public carriers probably will have made it even more impossible to avoid relatively heavy concentration in areas where nuclei of skilled labor, managerial knowhow and facilities were available.

During the emergency there will be a continual adjustment of labor from one defense industry to another as weapons requirements change. Some workers may have to be redeployed from production of munitions to that of the consumer goods needed to rehabilitate the nations and areas over which the tide of battle has surged.

Historically, during the active part of World War II, the continuous adjustment of manpower between various industries often amounted to demobilization of one and mobilization of another. The shift of gold miners to copper mines is one example. A second is the shift that occurred from shipbuilding to aircraft in the later period of hostilities.

Then at the end of the war there was the tremendous job of post-emergency demobilization of a 65-millions employed labor force, in round numbers, at least 17-millions of which had been added since 1940. This was the largest demobilization and reconversion problem ever faced by the United States. 2.5 million war workers lost their jobs in the month following V-J day.

Aid and re-employment assistance were provided the discharged war workers by the U. S. Employment Service, the Unemployment Compensation System of the Social Security Board, Civil Service Commission, Railroad Retirement Board and Agricultural Advisory Service to name a few. Each state and many municipalities had their own employment and unemployment compensation organizations.

Imagine the problem if there should be a comparable ballooning of today's reported labor force of 66-millions to around 89-millions. Greater effort would be required of placement organizations. More rapid growth of peacetime production would certainly be needed to provide jobs for an army of unemployed greater in size than our Korea Armed Forces at their peak.

Three Stages of Activity

One of the better means of solving this problem appears to be accelerated expansion of peacetime industry under healthy competitive safeguards together with a broader distribution of consumer goods than ever before realized. Some students believe it the best means.

For, during the years of any prolonged, openly acknowledged, armed conflict, consumers may accumulate appreciable savings, if not taxed or inflated away. Some could be in negotiable securities, some in bank deposits, some in currency. In part, these holdings would represent a financial reserve, but in part they would represent a probable demand for both durable and non-durable goods, especially those goods made from materials which were in critically short supply during the years of conflict. Care must be exercised in separating the wheat from the chaff in weighing the substance of the demand.

If in the weighing, the demand is determined to have substance, expansion of peacetime industry may be accelerated provided efficient management accumulated sufficient earnings from emergency defense production to finance its own aggressive reconversion program. Sufficient earnings should have been allowed to accumulate to finance de-mothballing of normal peacetime equipment and facilities, and re-erection on the plant floor. Sufficient untaxed earnings should have been allowed for replacement of equipment actually expended in emergency production. Sufficient returns from accelerated depreciation allowances should have been allowed to accumulate to take advantage of technological improvements.

During the first or pre-emergency stage, draft legislation should have been discussed permitting the accumulation of such earnings. Procedures would have developed if there had been honest discussion.

The Author

Colonel Brown, who will be remembered by the readers of SIGNAL *for his article in the July-August 1953 issue, "Marine Corps Electronics," serves as a Director of the Washington Chapter. His military activities began in 1929 when he graduated from the Naval Academy. Since that time, Colonel Brown has held various assignments in the Marine Corps including a tour for two years as chief of the Civilian-Reserve Instruction Branch of the Industrial College of the Armed Forces. During that time, he also lectured on Economic Stabilization and Production. Since May 1952, the Colonel has been head of the Electronic Supply Section of the Marine Corps Supply Department.*

Those who disagree that efficient management deserves the right to accumulate earnings from emergency defense efforts to finance a positive reconversion program should refer to that part of Chapter 41 of the Book of Genesis, which reads "take up the fifth part of the land of Egypt in the seven plenteous years. And let them gather all the food of these good years that come, and lay up the grain under the hand of Pharaoh for food in the land against the seven years of famine, which shall be in the land of Egypt, that the land shall not perish through the famine."

During the second or emergency stage, when flexibility is an essential, shift of product resulting from change of emphasis on weapons ought to be financed by government. But any shift to civilian type goods should be paid for by the business itself even if needed for the psychological aspects of the war. For such a shift is toward the rail position in the certain post-emergency race for peacetime product markets.

In the development and operation of an emergency production program for a full or all out mobilization one can confidently expect that it will be beset by changing requirements. Under such a condition contract terminations and the settlement of resulting claims should become relatively commonplace. After final strategic military victory, however, when entering the third or post-emergency stage, the situation certainly should have changed. Most terminations will be without benefit of new munitions orders and "no-claim" settlements probably will decrease. Some terminations may provide for diversion of production to one of the other aspects of the conflict, particularly the economic. In any event, the settlement problem may tend toward more friction at the same time the need for speedy settlements increases. Transmissions need a lubricant whether manual or automatic.

Prompt settlement of munitions contracts could be that essential lubricant of orderly reconversion and a steady

transition from a high-level mobilization toward a freer economy. Without it, many businesses, especially small or marginal companies, would be financially paralyzed because of working capital being tied up in inventories. Government and business are equally responsible and should have jointly trained termination personnel in the procedures necessary as soon as sufficient tactical military victories have been won to bring final strategic victory in sight.

However, with the emergency over, most of business retooling, some companies turning to new lines and growing unemployment, reconversion becomes essentially one problem with stabilization. Economic stability is important to Americans. It is also an essential condition for the economic health of the rest of the capitalistic world and thereby for its solidarity, security and freedom.

Planning Throughout Essential

Strangely enough, the transition from a controlled emergency economy to a free one must be planned. For every control there should have been a plan for its decontrol, drawn up and presented prior to the adoption of the control in the first place. Whether or not the plan is ever put into effect should not really matter. What should matter is that there was a plan from which to deviate as the situation dictated.

According to the analysis of one group which has studied the immediate post-VJ-day period, the rapid collapse and removal of controls after the active hostilities of World War II are illustrative of the detrimental effects of too early removal thereof.

Wage and price controls were abandoned at a time when the reconversion of industry to more normal peacetime production was hardly underway, at a time when there were extensive shortages in non-munitions and at a time when there was relative excess of purchasing power in the hands of too many consumers. The removal resulted in an immediate inflation which was less than disastrous only because of the unexepected and effective speed of industrial conversion. As the post-war inflation proceeded there was reported an increasing recognition that monetary and fiscal policies should have economic stability as their primary objective, not keeping interest rates at low levels.

Past experience has shown the necessity for considered delay in the release of controls, the necessity for resistance to the demands of pressure groups and that the release of the various controls must be carefully coordinated. Simply stated, the problem of economic stabilization controls during reconversion conveniently breaks into two subdivisions: a. The need for continuing any control at all; and, b. The desirability of changing the system operating at the time.

Either must be based on an accurate business forecast which will make it possible to determine how closely the country's productive resources will be in balance with requirements. If the balance is low on the requirements side, inflationary forces latent in the general situation may be difficult to repress. If the balance is heavily weighted on the side of production, deflationary forces would be strong. Unfortunately, neither inflationary nor deflationary pressures can be gauged simply by totalling dissimilar units of supply and demand to determine whether they balance at theoretical estimates of capacity. Hence, the requisite of a good forecast so that a fair guess can be made as to the balance.

Should expectations be for continuing inadequate or uncertain supply, the arguments for control would weigh heavily. If, by any chance, there should be general and continuing psychological and economic let down, good policy would dictate diminishing controls as rapidly as possible.

The prime disturbing feature of inadequate or uncertain supply is the way they can operate as bottlenecks to other production. To even spread theoretically just adequate resources over an efficient pattern of use is a formidable task without a degree of government control that may no longer be tolerable. Behind primary materials lie intermediate goods, sometimes in several stages, and behind intermediate goods lie finished products.

If the forward outlook of these materials indicates relatively long continued criticalness, then priorities for and allocating and perhaps rationing of those critical materials may have to be continued. The companion monetary, price and wage controls pertaining to products containing those critical materials may also have to be continued for some time.

In effect, this would be a change from a more positive overall system to one of selection. The proper aim of these material, monetary, price and wage controls should be to hold the line merely until the more acute consumer wants can be met through increased production. Once this object is achieved, demand pressures will tend to return to normal and sharp inflation would less likely attend complete revocation of controls. However, it could be that even a selective system based on material shortages would not be too consistent with capitalistic tenets.

An alternative, although itself not entirely consistent with capitalistic tenets, would be a vigorous, broad monetary control for the American economy and is a money one in many senses. Most Americans value their activity and possessions in money, exchange through money and hold money an asset. Control of the supply of money, affecting the cost and availability of credit exerts a noticeable influence throughout the whole American social structure. Monetary policy then seems an appropriate means for achieving stability. It could be exerted without the apparent central control over details of individual transactions so abhorred by free men. It would seem an acceptable alternative should there be a psychological let down.

If the reconversion is to be from a truly austere war economy it would seem that a combination of selective material controls and a broad monetary control would be more suitable. There may be many who sincerely believe this would be a minimum of control in the circumstances.

The circumstances, it must be assumed, of an "A" or "H" war would have caused more of a stricture of the American economy than did any previous war. Yet, toward the end of even such a war it should be possible to decide the need of continuing what stabilization controls, if any. How to continue the control or how and when to drop it could be worked out by simply deviating, as necessary, from the plan evolved in the pre-war period.

The tactical climax or end of an "A", "H", or World War III can probably be seen at or near that time, so that the economy may be shifted into a considered reconversion thus avoiding cankerous recession. But suppose that by 1984, the World has suffered another Thirty Years War, or that by 1960 the late Senator Taft's 1950 guess of a decade of Cold War should have been proven. What then?

It may not have been a question of "guns or butter." Our economy since that fateful June day in 1950 has shown that. Probably it may be reconversion from an economy of intercontinental jets, guided missiles and ice cream and cake. There may have been so much cake that even a temporary contraction to a level that would spell "mild recession" would be difficult to visualize.

Provisions for Increased Labor Force

It may be difficult to grasp the meaning of weekly indexes such as appeared just before last Christmas when a national business and financial weekly showed the following:
Industrial production off six percent since the previous year:

1. Steel ..... off 11%
2. Petroleum ..... off 5%
3. Coal ..... off 15%

Carloadings down 10 percent since the previous year.

(Evidently those economists and businessmen who still believe the business cycle has not been entirely eliminated and must be taken into account have certain merit in their thinking.)

Yet, the problem, whether recognized or not, of controlling the amplitude and frequency of our economic cycles so as to disrupt a relatively free life would still be a prominent one.

In discussing the problem of reconverting from a decade or more of a materialistic struggle for men's minds, a cold war, it appears well to follow the broad outline of the first part of this paper, namely, to discuss manpower. production and stabilization in that order.

Interpolating one competent authority's estimates, the population of the United States in 1960 will be 166,000,000 and in 1984 around 194,500,000. Out of 1960's 166-millions of people other authorities place the total employed at 72.3 millions, including an Armed Forces strength of 3.5 to 4 millions. This number of employed is 6.3 millions more than our today's reported labor force of 66 millions, an average annual increase of over one million workers.

The maintenance of full employment in any reconversion then means not only providing jobs for the emergency workers laid off following a lull in the struggle but also for around one million more workers just entering the labor market. This may well be the objective of all pre-emergency planning. Development of new industries to satisfy new consumer wants seems necessary to provide employment opportunities for these people.

Development of new industries may also be necessary to provide jobs for those workers who are temporarily without work as a result of rising productivity of labor. Both management and labor leadership ought to realize that the surest and probably the quickest way to alleviate individual suffering lies neither in super-gadgetry nor slowdown but in producing a better product at less cost so that more consumers can find it worth while to spend. Then and then only may proper money become available to finance the development of new industries.

Management and labor, sitting together in the second, or emergency stage should work out the details of the development. The details, for example, could be a shift from black and white to color or from color to "3-D" within reasonable costs, something less than a 1,000 percent increase. Abnormal price increases even in product shifting feed the fires of inflation. As far as price increases are concerned, perhaps the electronics industry would do better to abide by its historical pattern rather than follow the automotive.

solution to production problems at any time. Management and labor must have planned to bring this about if capitalism is to survive.

Going back to the ideas expressed before, "there ought to be a rising level of personal consumption" and "a broader distribution of consumer goods than ever before realized." one wonders if the American economy could still remain dynamic—fulfilling little by little the promise of better living, while providing a strong economic base against the danger of succumbing to communism. It ought to be that a capitalistic society adjusts itself to change, produces both men's needs and wants all the while maintaining freedom of the individual. But, can it?

Yes, provided there is sufficient stability to the economic system to prevent too high and too frequent production peaks, too much cake, and too many recessions which after upturns are discovered to have been depressions.

How to Achieve This Stability

A measure of stability may be obtained prior to an emergency by building in to the economy, or enlarging on them if already present, certain shock absorbers. Most authorities agree that the following assist in dampening wide oscillations of the American economy:

1. Agricultural supports;
2. Government interest payments on the huge debt;
3. Social Security;
4. Unemployment insurance;
5. Union wage contracts; and curiously enough,
6. The big federal budget.

Perhaps added to the above, could be:

7. Federal deposit insurance;
8. Housing and home mortgage legislation;
9. Minimum wage laws; and,
10. Securities and exchange regulations.

"The United States must demonstrate conclusively that capitalism does the most good for more people than any other economic system. Otherwise our country cannot remain a pillar of strength in the free world."

The shift to new industries and utilization by them of many productive resources previously involved in the emergency defense effort should be accomplished quickly and without fanfare. Concurrently, there ought to be a rising level of personal consumption if these new industries and older marginal ones are to live and survive. This is surely true if there has been a "guns and butter" economy.

If there had been no butter, but merely crusts of bread, then the situation would be similar to that following a war comparable to World War II. Consumers could have more than sufficient savings for filling needs. They could have savings with which to fulfill neglected wants. Business would only have to be careful to understand what is real and what is padded in the way of consumer demand.

Consumers Pick and Choose

However, if there had been a butter economy the need for considered action should be understood. During a butter economy the savings held over from "crusts of bread" may have melted, just as the liquid savings of millions of families were drawn down or exhausted between V-J day and 1952. According to the Federal Reserve Bulletin, September, 1952, the average (median) liquid savings of all spending units had decreased to $230 from a 1947 average of $470. At the same time inflation had caused a lowering of about 19 percent in the real value of the $230 below the 1947 level.

With this in mind it should be readily understood that "week-end" selling campaigns and take-it-or-leave-it attitudes won't work in a nucleonic age. Apparently the issue may be up to the consumer who can be choosy as to the brand of molasses he buys. In other words "old-fashioned pride in modern workmanship" may be the vogue.

Well made products to fill old needs and good products to take care of new wants both within reach of the majority of consumers' deflated pocketbooks appears a not too bad

Some students of the problem of economic stabilization believe those 10 influences insufficient unto the time. A few of these suggest that the chief safeguard before and after an emergency lies with a flexible monetary and fiscal policy. One organization even suggests 10 specific ways to control a decline.

This last organization appears to include in its 10 ways:

1. Increasing agricultural support;
2. Lowering the rate of interest on the public debt;
3. Permitting an increase in the federal budget by allowing bigger deficits;
4. Dropping the interest costs on housing and home mortgages;
5. Lowering margin requirements on brokers' loans; and,
6. Lowering taxes.

The idea of lowering taxes would have considerable labor support, probably of management too.

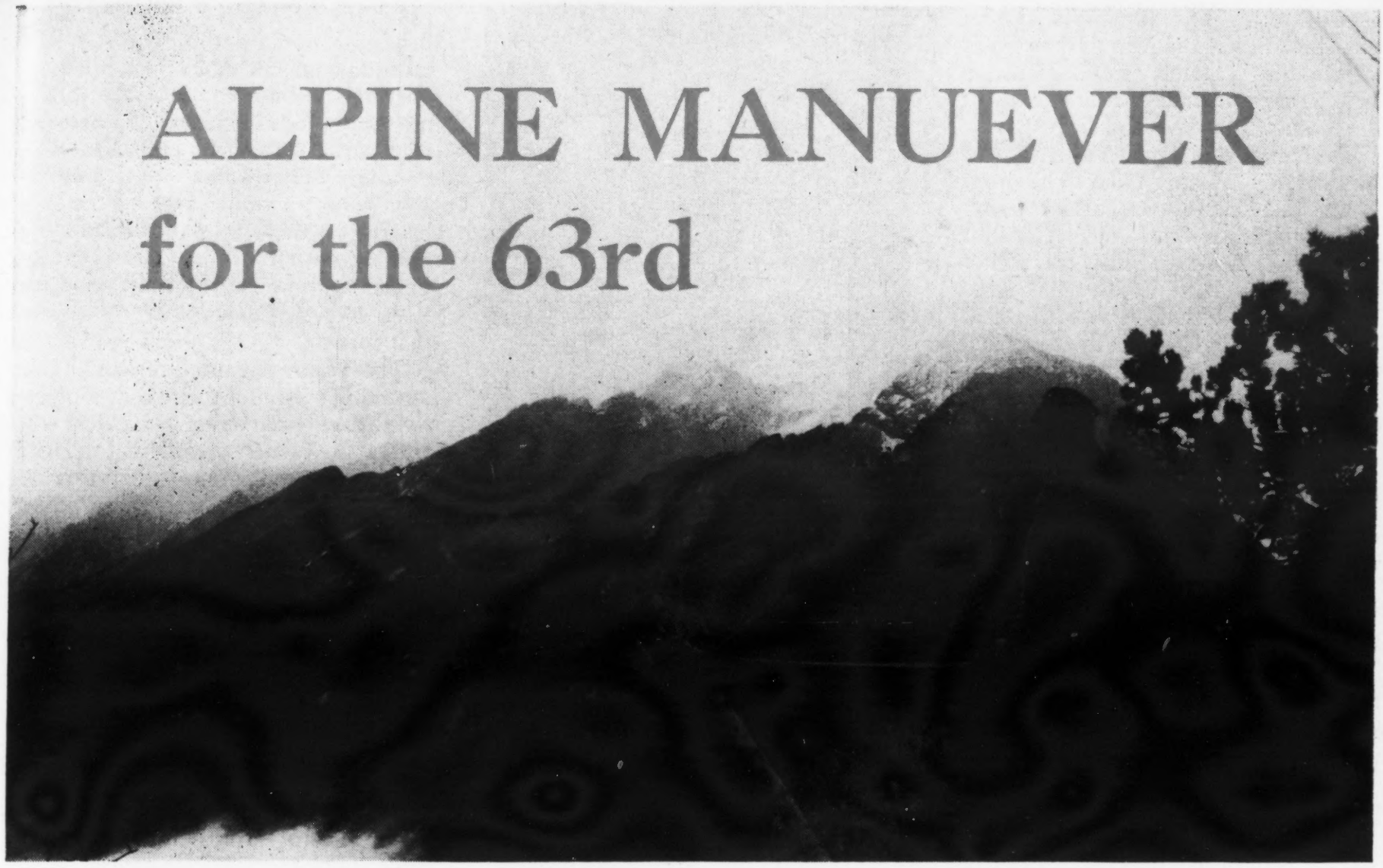
The six specific ways mentioned to control a decline or bring about an upturn are direct actions achieved by indirect controls. There could be many indirect controls associated with a flexibile monetary and fiscal policy, one of the most important being that over consumers' credit.

Assuming that reconversion from the present material struggle for men's minds will take place in 1960, it will either be from an economy of: *Ice Cream and Cake* or *Crusts of bread.*

If the first, then it may be assumed further that there will not be a wide and deep river flowing from a reservoir of savings. Around 50 percent of our country's spending units may have less than $200 as liquid assets. One out of every ten spending units may already owe one out of every five dollars of their money incomes, before taxes, on short-term consumer credit alone. Disposable personal income may be almost seven percent lower than it was shortly after World

(*Continued on page* 79, *col.* 1)

ALPINE MANUEVER for the 63rd



On June 21st, the Signal Corps celebrates 94 years of outstanding service to our country. Wigwag flags and torches were its start; radio beams bouncing off mountains in Austria we have now; the future? boundless—the surface of modern communications and electronics has been barely scratched.

AT THE CLOSE OF THE ANNUAL FALL manuever conducted by Headquarters, United States Forces in Austria (USFA) last year, one of its assigned units, the 63rd Signal Battalion (Operations) decided to conduct its own small-scale exercise as a supplement to the big one. Accordingly, it launched Project GAMS, which, though small in terms of numbers of men and objectives, was nevertheless a hair-raising mountain operation aptly named in honor of the Gams, small goat-like animals of the southern Austrian alps.

The exercise—development of an AN/TRC site on a high point—was designed to serve a three fold purpose: 1) to utilize the knowledge and experience of battalion personnel who had already received training in mountain climbing, 2) to demonstrate for the benefit of those who had not, the methods and techniques brought into play in the establishment of such a site, and 3) to indoctrinate all personnel in utilization of mountain-climbing techniques and to point out logistical and tactical considerations in communication operations in mountainous terrain.

Thorough reconnaisance and planning went into selection of Hill 1629 in the vicinity of Lofer-Saalfelden as the most logical site for the proposed exercise. It was considered eminently suitable for mountain climbing techniques and was centrally located in the neighborhood of the mountain training center and headquarters of Company "B" of the 63rd.

The hill, 5343 feet high, was later nicknamed "Agony Hill" for reasons that became very obvious when battalion personnel began the task of transporting men and equipment to the end of the jeep trail, then manpacking all items 1500 yards uphill to the base of a 1200 foot bluff where suspension ropes and traverses completed the job of hauling equipment to the top of the mountain.

At the close of the USFA maneuver, officers and men of the 63rd who were to assume key roles in the exercise—company commanders, section leaders, etc.—were assembled at the battalion command post and thoroughly briefed as to the problem and the points to be covered. Each of the three companies involved was presented with verbal orders outlining a definite responsibility in the action. Aerial photographs of the hill, requested in advance, were distributed and used to illustrate points of the explanation.

The AN/TRC equipment on Hill 1629 was installed above a 350-meter rock face. Here suspension ropes became indispensable. At the foot of this face, a base camp was established to lend logistic support to elements working above on the mountain.

Jeep-mounted equipment could be transported within 1500 yards of the base camp where a jeep park was established. Telephone carrier equip-

ment working into the radio system was sheltered at the jeep park as were terminating carrier circuits from a switchboard installed at the foot of the mountain at Weissbach.

The completed system consisted of two carrier systems from Weissbach to the jeep park; two carrier terminals operating into the AN/TRC terminals; two AN/TRC terminals on top of Hill 1629; AN/TRC relays on Loferberg, Hill 978 (relay hill) and Camp Roeder; and two AN/TRC terminals with associated carrier equipment at Director Headquarters.

In support of this system, the following circuits were installed; 1) a 40 mile landline field cable system between Weissbach and Director Headquarters (using two CF-4 Repeaters), and a commercial circuit from Weissbach to the Salzburg Military Long Distance Switchboard.

In addition, an AN/GRC-26 net was established between Weissbach, Loferberg, Relay Hill, Camp Roeder, Director Headquarters and the battalion command post.

In the event communications could not be established between Hill 1629 and Hill 978, a mobile AN/TRC relay team was on hand at Director Headquarters to effect a "bounce shot" from 1629 and relay into Director Headquarters. This team included an AN/GRC-26 for direct communications with Weissbach in a separate net.

This is the background for the exercise in which a race with the weather is figured, in which dense mountain fog, snow and icy rocks were all to play a role.

A brief outline of the assignments handed the individual companies of the 63rd provides an interesting insight into the amount of preparation, planning and logistical support such operations demand of units.

During Operation "Gams," equipment had to be dismantled and transported by suspension ropes to the top of the mountain. Here, a container of gas is attached to the ropes for hauling to the top of the mountain to supply the generator.

Company "A" was held responsible for all communications east of Berchtesgaden. This entailed operation of AN/TRC equipment for Director Headquarters; installing and operating an AN/TRC relay station on Hill 978; furnishing a mobile AN/TRC relay team (for the bounce shot from Hill 1629); furnishing four AN/GRC-26 sets to operate in two nets; installing and operating a CF-4 repeater in the landline cable; and, of course, furnishing logistical support for all of the above.

As its share of the responsibility, Company "B" was detailed to establish and operate the two AN/TRC terminals on Hill 1629; establish and operate the base camp at the foot of the bluff; establish and operate the jeep park; furnish 35 enlisted men as handlers between jeep park and the base camp; maintenance of the road leading to the jeep park; installation and operation of the CF-4 repeater in the landline cable circuit; and furnish five AN/GRC-26's to operate in two nets.

The 258th Signal Company (Construction) brought existing Spiral-4 landlines (maneuver circuits) between Weissbach and Director Headquarters into action and provided carrier circuits between these points. It also laid Spiral-4 cable from the top of Hill 1629 to Weissbach through the jeep park; laid Spiral-4 cable from Weissbach to Company "B" area; laid WD-1 lines from the jeep park to the top of Hill 1629 and from the base camp to the jeep park.

The 258th also maintained all cable and wire used during the exercise.

Additional assistance, support and guidance which the battalion was not equipped to handle for itself came from two Austrian mountain guides and three enlisted men from the Tac Command Training Center who accompanied and assisted Signal Troops throughout the exercise and offered invaluable advice and assistance. Medical support in the form of an ambulance, a driver and two aid men came from the 109th Field Hospital and a driver with litter carrying jeep and one aid man was contributed by the Medical Company of the 350th Infantry regiment. Pilots and airplanes of the USFA Air Section provided flight facilities for aerial reconnaisance and photographic coverage during the exercise.

Jeeps assigned to the exercise were ordered to be equipped with skid chains regardless of the weather and the best drivers were chosen for the job of jockeying them up the tricky mountain roads.

Gasoline and motor maintenace for the exercise was a function of the battalion motor section. The battalion S-4 provided the rations—three days' C rations, and two days' 5-in-1 rations.

Scheduled to run from Friday through the following Friday, Project GAMS was launched according to plan. The first and second days were devoted to moving Company "B" into its assigned bivouac area. It was quickly discovered that the secondary road from Weissbach to the mountain trail would not accept vehicular traffic over three quarters of a ton. This limited the transportation of men

The "A" frame, also shown on the first page of this story, was located on the top of the mountain. A member of the 63rd Battalion here brings up supplies for the AN/TRC-4 units which have been reassembled on Hill 1629.

and equipment.

A further limitation was imposed by the fact that the mountain trail from the Weissbach secondary road to the jeep park was unsurfaced, with corduroy bridges spanning the streams and gullies. Vehicular traffic on this road was limited to quarter-ton vehicles. In this two day period, all companies made preliminary reconnaissance of their particular areas of interest.

On Sunday, personnel of the battalion spent the day moving the necessary equipment from Company "B" area to the jeep park, higher up. Here it was learned that the power units required to support operations on Hill 1629 were too heavy to be handcarried the 1500 yards between the park and the base camp. They were therefore disassembled into three parts to facilitate transport by the men and by the rope system.

All other equipment,—food, water and POL products—had to be handcarried to the base camp. Handlers learned that a slow, steady movement helped to compensate for the lack of oxygen in the air at that high altitude. As the gear was being moved to the base camp, the weather deteriorated and snow threatened in the mountains. Accomplishing the move in a single day gave the men of Company "B" an opportunity to race against the weather before the hill was covered by snow.

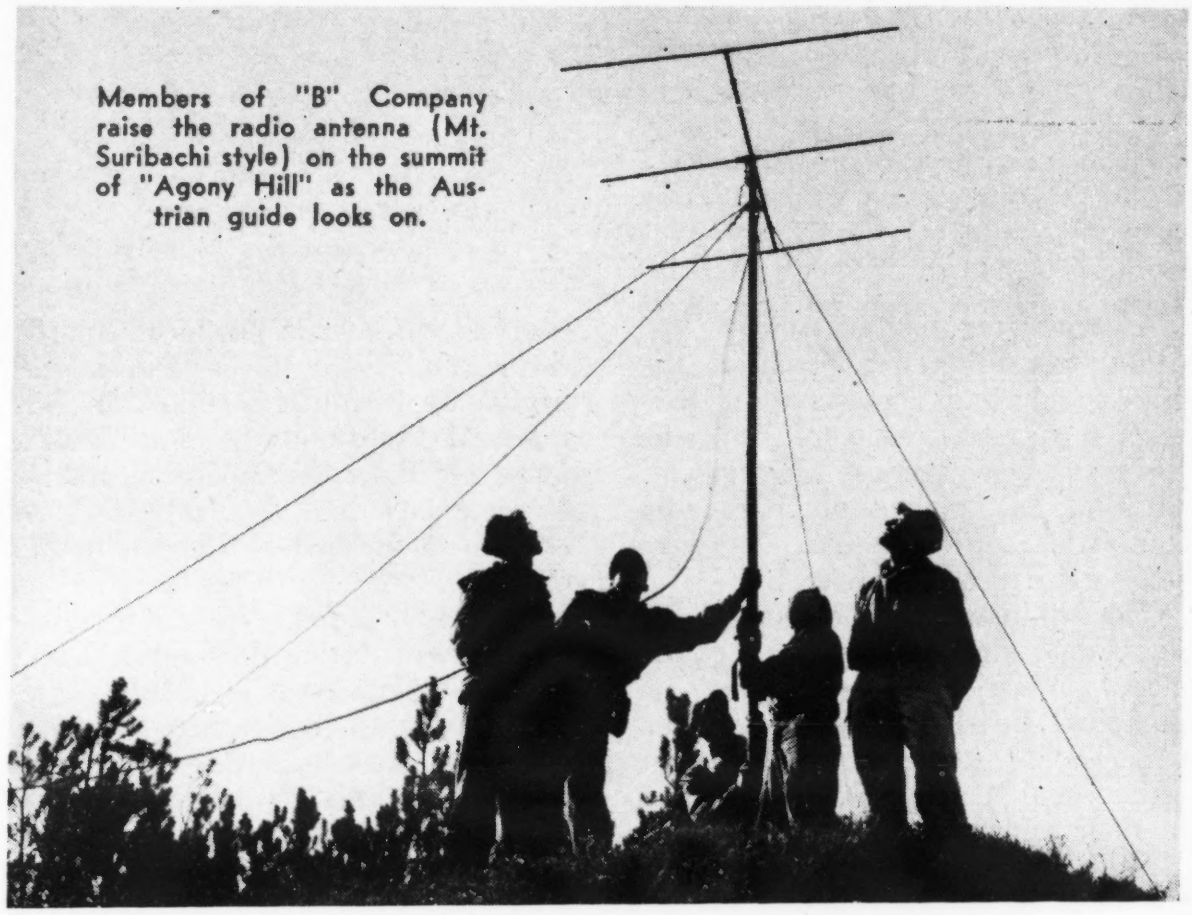
On Monday, the rope systems were only partially installed on Hill 1629. This construction of vertical rope suspensions to raise equipment up the perpendicular slopes, and traverses to cross chasms and valleys is a complicated art in itself, involving A-frames, pulleys and all of the science of ropes and knots known to the mountain climber. The complicated system installed by the 63rd consisted of two traverses and three vertical links and resembled an aerial tramway in operation, with equipment travelling up and down the mountain in rope slings. The unit found it necessary to protect equipment on all sides by packboards to avoid damage caused by contact with the face of the rock wall.

Tuesday found completion of the rope systems hampered by dense fog and ice on the rocks. It was not until the following day that the rope system was finally finished.

As a result of concerted efforts by all personnel, all equipment necessary to install the station on Hill 1629 was hauled to the top the same day the rope tramway was completed. The 63rd personnel learned the hard way that for every man at work on top of the mountain, three were employed at the base camp to provide logistical support. This lesson cannot be overemphasized, according to the battalion S-3.

When the station was put on the air, both circuits came in with strong, clear signals. Both were ordered to remain in service all night in order to check the effect of atmospheric conditions on the operation. No problems of this kind were encountered.

The officer-in-charge of the station on the mountain was ordered to send all spare equipment, bedding and other non-essentials down to base camp early Thursday morning. In the meantime, he was directed to continue operation to Hill 978 and to break down the Loferberg link and reorient the antennas for a bounce shot early the next day.



Members of "B" Company raise the radio antenna (Mt. Suribachi style) on the summit of "Agony Hill" as the Austrian guide looks on.

During preliminary map reconnaissance of the AN/TRC shot from Hill 1629 to Hill 978, four trial map profiles disclosed that a pair of peaks masked the line of sight by 60 to 240 meters. This raised the question of whether such a shot would be feasible. Quality of the signal received later indicated, however, that this mask had not affected the shot. This would seem to bear out the theory that a masking peak need not be considered a disadvantage to VHF radio relay in every case.

The spare equipment came down to the base camp on schedule on Thursday while on top of the mountain the necessary re-orientation of antennas had been accomplished. At 1300 hours, Project GAMS was officially terminated and the remaining equipment was started down to base camp via the rope system, and on Friday all units returned to their home stations.

Project GAMS taught the men and officers of the 63rd Signal Battalion many lessons about operations in mountainous terrain. They learned that communications in high mountains can be slow, physically exhausting, and even perilous unless the communicator is trained in mountain climbing.

All were impressed with the disproportionately large number of people required to lend logistic support to even a small detachment operating in high mountains.

One of the most significant results of the operation was a forceful demonstration of the extreme mobility and transportability of Signal Corps equipment. Realization that items like the power units for the AN/TRC station on Hill 1629 can be broken down by operating personnel for transportation purposes, reassembled at the operation site and placed into action within a short time opens almost limitless avenues of possibility for the ingenious commander with trained personnel under his leadership. The conclusion must be that communications can be installed and placed into service in any terrain when needed.

Considered in the light of the many lessons learned during the Korean conflict about radio relay activities, Project GAMS adds worthwhile information to the data already in the files on this subject. Whether the theater of operations be in Europe or the Far East, units like the 63rd prove that we are ready to communicate where and when communications are needed.

Westinghouse

New Developments from Research at Baltimore Divisions

by Carlyle W. Miller
Sales Manager, Electronic Division
Westinghouse Electric Corp.

A PIONEER SUPPLIER OF SHIP-TO-SHORE transmitters, as well as the first supplier of combination telegraph-telephone receivers for the Navy, the Westinghouse Electric Corporation has been supplying radio equipment to the military services since before World War I.

The company has pioneered, too, as a supplier of military radar equipment. When Japanese planes approached Pearl Harbor on December 7, 1941, it was a Westinghouse radar set that gave the first warning of their approach.

With the advent of World War II, the engineering and manufacturing experience that had been gained in the past by the company's Electronics Division at Baltimore, Maryland, made it possible to handle the tremendous expansion programs demanded by the war effort.

All through World War II the Electronics Division designed and produced a wide variety of communications and allied electronic equipment for many branches of the service. Practically every ship in the Navy had at least one type of communication equipment aboard which was manufactured by the company's Electronics Division.

As a result of the vast expansion of engineering, research, and manufacturing facilities, electronics contributions by Westinghouse during and since World War II have been many.

Air search, fire control, and surface search radar equipment has been developed and produced for the Navy and Signal Corps, search and fire control equipment for the Bureau of Aeronautics, chronograph units for the Government Ordnance Departments, and special radar test equipment for many branches of the services.

The rapid increase in activity since World War II in this development and production of airborne radar, armament control directors and automatic pilots, led to the organizing, in 1951, of the company's Air Arm Division. The new plant handles all phases of the development, design and manufacture of airborne armament equipment. Its output, which goes entirely to meet the requirements of the armed forces, supplement the many other electronic products turned out by the Electronics Division.

Typical of the equipment produced by the Air Arm Division is a combination Search, Fire Control and Tail Warning radar used in night fighter planes. Four times more powerful than its predecessor, the radar searches for the target and follows it until the objective is relatively close. Then a second radar unit is energized and tracks the target automatically, giving the pilot computed direction and distance to the enemy craft. While this is taking place, the areas to the sides and rear of the plane are being searched for any further target.

Among the many engineering advances incorporated into the new radar designs is the use of magnetic amplifier circuits for holding voltages constant. This represents quite an accomplishment in aircraft radar design since aircraft power supplies vary from 102 to 124 volts, at frequencies of 380 to 420 cycles per second. Furthermore, the radar load will vary as much as 20 percent, depending on the phase of operation of the equipment. An error detector controls a two-stage Magamp, which in turn regulates the filament supply voltage. By using Magamps in this way the effective filament heat is held to within one percent of its rated value.

Since the end of World War II, much work has been done by the Electronics Division in conjunction with the Air Defense Network on both radar and missile problems. A design program initiated for the Navy Department resulted in a lightweight shipboard radar for air and surface search. A special radar unit specifically designed for the submarine service was also produced by the Baltimore Division, as was most of the control equipment for the power plant of the atomic submarine, the *Nautilus*.

The engineering and research facilities which have been developed at Baltimore are continually being pressed to reduce the size and weight of the military equipment while increasing its operating simplicity and reliability. Some of the results of this work are the improved transformer designs now being incorpor-

ated in equipment, and the knowledge and use of such circuit components as Magamps and transistors.

Consistent with this emphasis, much work has been done on reducing the weight of radar antennas. As a result of this work, a new air and surface search radar antenna for shipboard use was developed for the Navy Department. This new antenna not only weighs 50% less than previous models, but it has improved air search performance. The advance design principles incorporated in this design are now being considered in new ground radar installation designs.

Further advance design resulting from the engineering research program has reduced a special feed horn that permits the simultaneous transmission or reception of radar and identification signals. This unit, quite revolutionary in design, can be adapted to many existing radar antennas.

During World War II and since that time, the Electronics Division has produced communications transmitters for military shipboard and ground installations in frequency bands ranging from low frequency (100 to 150 kilocycles) to ultra-high frequencies (200 to 400 megacycles), with power outputs varying from 10 watts to half a million watts.

Presently under development is a new transmitter design which is directed toward the ultimate in simplicity and reliability without sacrificing the necessary performance requirements. This design contains a continuously variable oscillator which can be tuned over the frequency range of 300 kilocycles to 30 megacycles with a minimum tube and component complement.

Still another research project is underway for modifying one of the Navy's high powered, very low frequency transmitters to permit four times as many transmitted messages to be handled as can be handled at present.

The roll-out construction of the Type MW units permits easy access to all components, thereby greatly reducing the space required. The power supply units at left will supply various combinations of RF or modulator units to provide the services desired.

Probably the most outstanding example of the advanced circuitry and design resulting from the stepped-up research program is seen in Westinghouse Type MW Transmitter. Built to send signals several thousand miles, the high frequency version of the transmitter has a frequency range of 2000 to 30,000 kilocycles, approximately the wave band of short-wave radio. The low frequency version, designed for ship-to-shore communications and radio beacon service, operates in the 250 to 540 kilocycles band.

The building block design permits the assembly of individual units which can be used in many combinations to supply any desired type of service. Four telegraphic channels or two voice channels can be operated from each power supply. The telegraph channels are keyed electronically to achieve code speeds up to 500 words per minute.

The extremely small size and weight, compared to conventional standards, is largely a result of using new materials and components. The circuit uses self-healing, highly efficient vacuum capacitors, which are variable over a wide range.

Improved safety features incorporated in the MW include grounding sticks on the doors of all cubicles, removing high voltage when doors are opened.

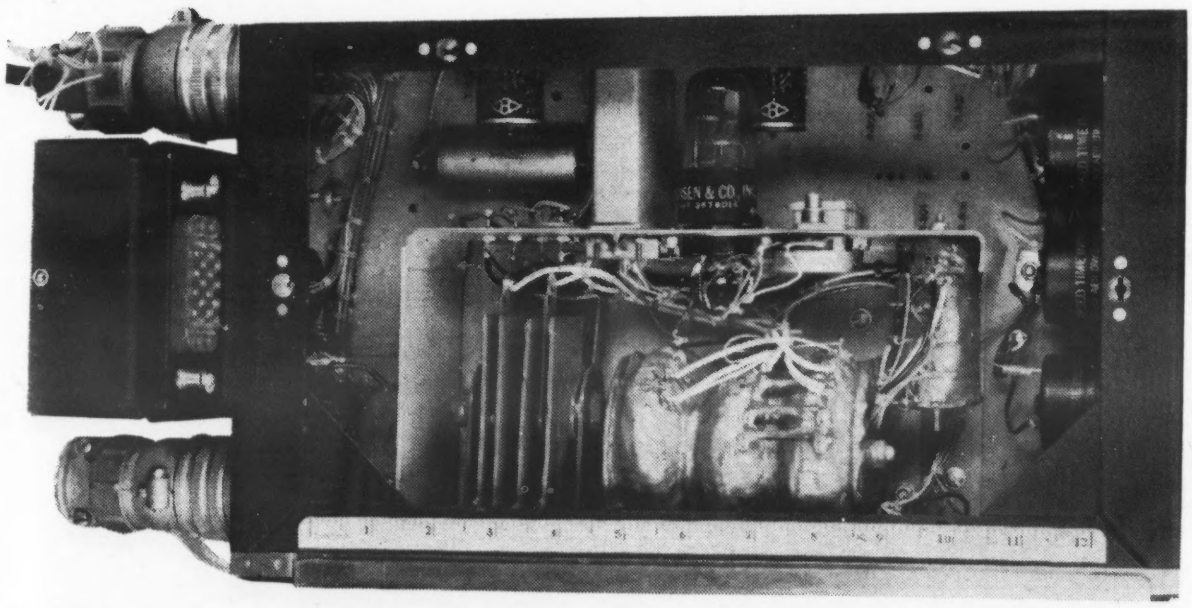
Designed for long range, fixed station operation, the MW has been applied for ground-to-air as well as ground-to-ground operation. Among the services that can be handled by it are: on-off radiotelegraphy, radiotelephony, frequency shift keying, tone modulated telegraphy and facsimile operations.

The low frequency version offers broad band circuits which require no tuning. Uniform response over the entire desired frequency range permits frequency changes merely by changing crystals.

The extended capabilities of modernized components used in the MW permits operating far below rated values. The degree of stability of operation thus achieved has resulted in power amplifier tube life of up to 25,000 hours.

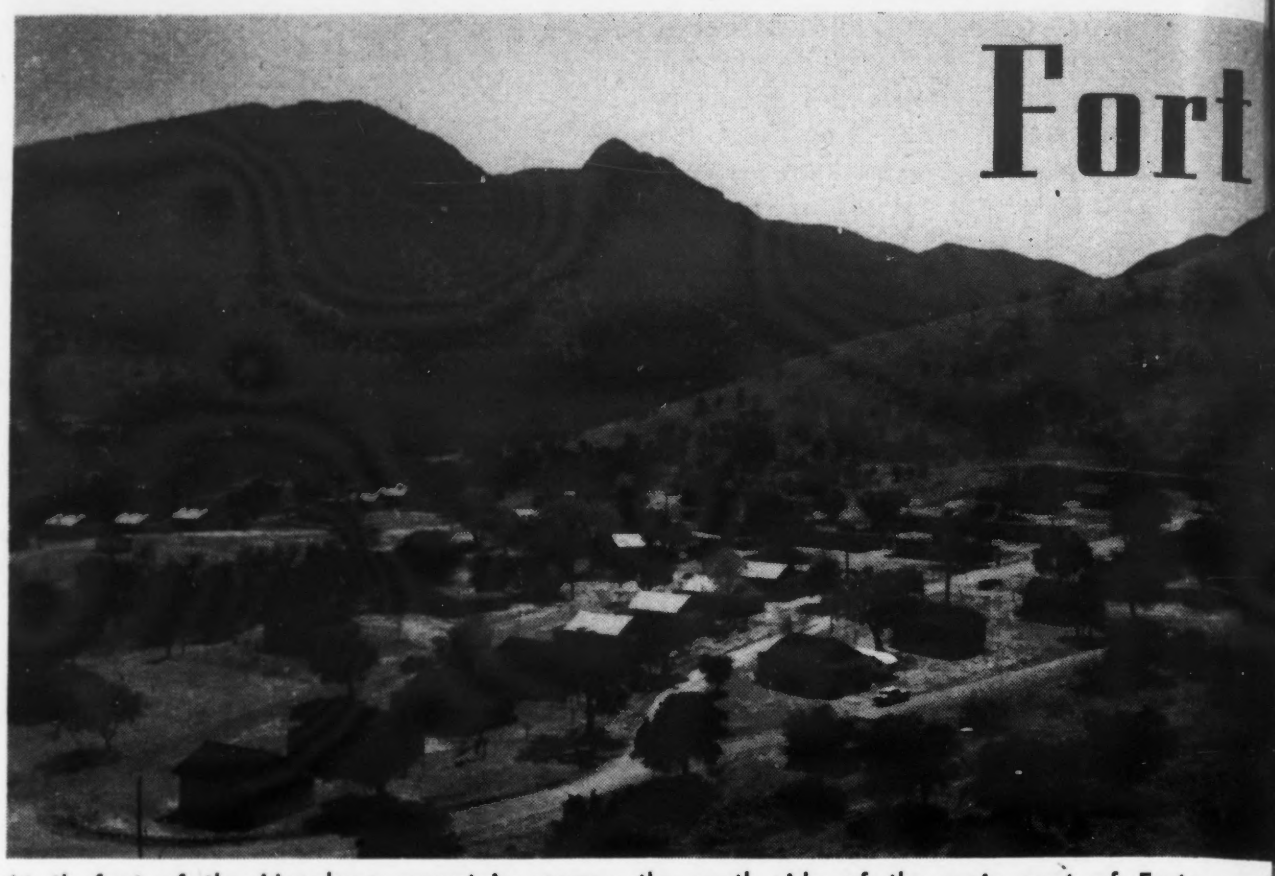
Specially designed compressor and peak limiter circuits in the MW Modulator Unit provide a carrier noise level of better than 45 db below the 100% modulation level. Consequently, the transmitted voice intelligence is of a very high quality.

These and many other developments resulting from the expanded research programs at the Westinghouse Air Arm and Electronics Divisions are yielding many basic ideas in the fields of electronics and communication. The continuation of these programs holds great promise for the future of both these fields.



The above is typical of the simplified construction and circuitry used in modern airborne radar equipment. The Magamps, shown in the lower center, regulate effective filament heat to within one percnt.

Fort



At th foot of the Huachuca mountain ranges, the south side of the main post of Fort Huachuca is located. The housing area, the "Bonnie Blink," is for officers and enlisted men.

LOCATED AT THE ENTRANCE TO A canyon in the Huachuca Mountains of Arizona stands Fort Huachuca, the new Army Electronic Proving Ground.

On February 1, 1954, the activities of the Electronic Warfare Center, previously carried on at Fort Monmouth, New Jersey, were transferred to Fort Huachuca. This work, which is highly classified, consists primarily of tactical development and tests of electronic warfare equipment, organization and doctrine.

Brigadier General Emil Lenzner, former chief of the Plans and Operations Division in the Office of the Chief Signal Officer, is the Commanding General of Fort Huachuca. When the installation reaches its full complement, General Lenzner will have approximately 7,500 military and 1,000 civilian personnel under his command.

The battlefield surveillance program which will be carried on at Fort Huachuca will involve field testing and evaluation of equipment and technique, including ground and airborne television. This program was initiated during the past year as a result of special studies conducted by the Army in conjunction with the Navy and the Air Force. Based on these studies, it was determined that the Army should take all possible measures to extend its capabilities through electronic means in the surveillance of battlefield areas in order to provide faster and more accurate information under combat conditions.

Responsibility of the Combat Developments Department at Fort Huachuca will be the over-all coordination, systems analysis, experimental field tests and preparation of military characteristics. Its ultimate objective is to insure Signal Corps readiness to provide timely, adequate and reliable means of signal communication for efficient exercise of command, and prompt transmission of information and instruction in modern and future warfare.

The Combat Developments Department will determine requirements for and prepare military characteristics on new signal equipment, review training and operational literature, and plan and supervise troop exercises used to test signal doctrine, policy, procedures and techniques.

Signal Corps aviation activities at the new proving ground will include technical and tactical tests of Army aircraft communication and navigational systems and equipment. Also, aircraft will be used at Fort Huachuca in connection with the developmental work to be conducted in the fields of electronic warfare, battlefield surveillance, communications and photography. This program will be carried on by the Signal Corps Aviation Center which is also being transferred from Fort Monmouth.

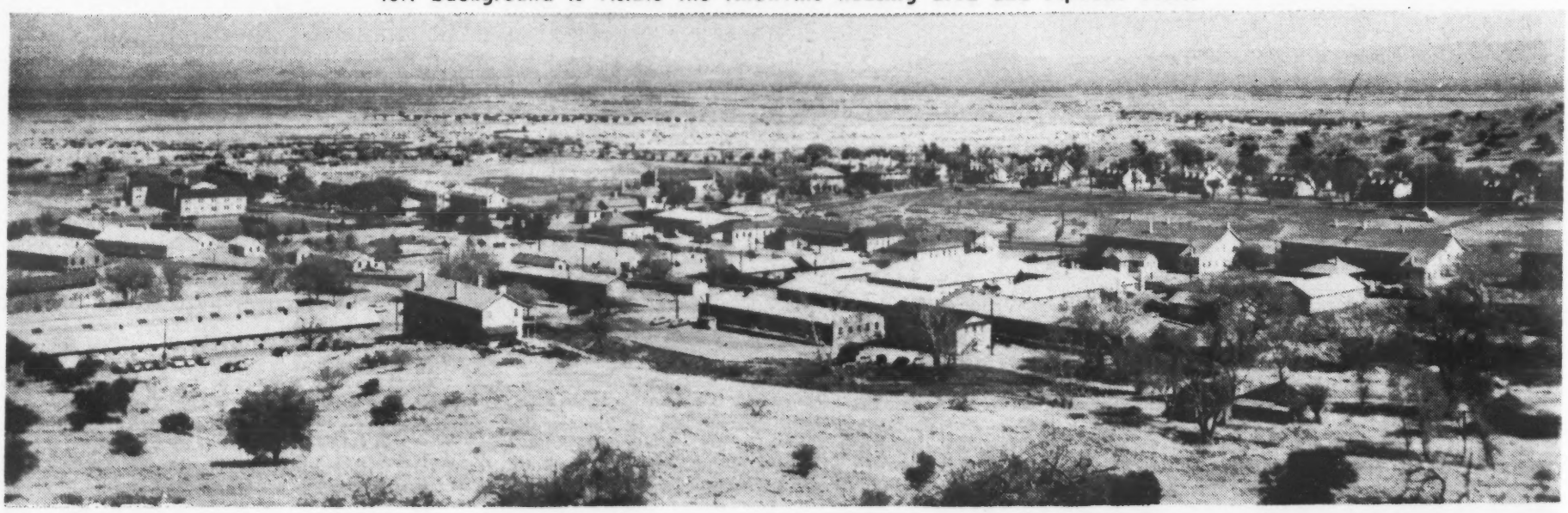
As a Cavalry outpost, a permanent Infantry and Cavalry station, and as a Division Training Post, Fort Huachuca has had a profound influence on the history of the Southwest.

Made History Through the Years

The Arizona Territory of the 1870's was a wild and lawless land, peopled by scattered pioneer ranchers, prospectors, small mine owners and Indians. It was to protect these inhabitants of the territory and to control the bands of outlaws and hostile Apaches that roamed this area, that Captain Samuel Whitside and two troops of the Sixth Cavalry were dispatched from Fort Grant, Arizona Territory, on February 12, 1877, with orders to establish a temporary camp in Southeastern Arizona.

A canyon, located in the Huachuca Mountains, proved an ideal site for

General view of Fort Huachuca. The Post Engineers warehouse and the Post Engineers office are in the lower left foreground. The commissary and warehouse, and the transportation section and warehouse, are located in the center foreground. Old type barracks, which are not in use at the present time, are in the right background. The field grade officers' homes are located behind the barracks. At the upper left background is visible the Knowville housing area and Apache Flats.



Huachuca— from cavalry to communications

Research and development at the new Army Electronic Proving Ground will be "top secret," but here is a little background that may satisfy your curiosity about this former outpost.

Two soldiers stand in front of the orderly room of the 73rd Signal Company (EW-4). This company was the first signal company to arrive at Fort Huachuca.

this camp. The name, "Huachuca," of Ciricahua-Apache origin, and meaning Rainy Mountain, gives a clue to the advantages of the camp site in an otherwise hot and arid area.

Camp Huachuca's activities against the raiding Apaches were successful and in 1882 the camp was made a permanent military establishment, consolidating the functions of several small camps in the area at Fort Huachuca.

As the Indian troubles subsided, life for the troops settled down to routine garrison duty. Across the border, however, the dictatorial rule of Porfirio Diaza, who had governed Mexico since 1876, was meeting growing opposition.

In November, 1910 an insurrection began in Mexico, and troops from Huachuca were rushed to patrol the border. United States Army units from Huachuca, posted at various points along the Arizona and New Mexico borders, were instructed to prevent armed parties or munitions from crossing the line into Mexico and to preserve the neutrality of the United States.

Continuing violence in Mexico kept Huachuca soldiers occupied for several years, and culminated in Pershing's punitive expedition against Pancho Villa. The 10th Cavalry, a Fort Huachuca unit, participated in this campaign.

Meanwhile, the importance of Fort Huachuca had increased to a point where added facilities were required, and in 1913, new construction was authorized to bring the Fort up to a level capable of housing and supporting a Brigade. It remained at this size during World War I and after it.

Just prior to World War II, an expansion program was initiated and facilities for 5,000 troops were constructed. Before the war was over, the Post had been raised to a level where it could support approximately 27,000 men.

At the height of its World War II activities, Fort Huachuca was as complete as any modern American city. There were athletic clubs, swimming pools, theaters, and an electric plant capable of lighting an entire city. The Post also had an up-to-date air base with a 5,000-foot landing strip.

During World War II, Fort Huachuca was utilized as a Division training post. The 92nd Infantry Division, and later the 93rd Infantry Division, were trained here prior to their deployment overseas.

Postwar military cutbacks forced the inactivation of Fort Huachuca in 1947, and the reservation and facilities were then turned over to the State of Arizona.

Military activities were limited to summer exercises of the Arizona National Guard until the Spring of 1951 when Fort Huachuca was reopened as a base for training ground troop aviation engineers for Korea. Following two years of activation, the Post was again placed in standby status in June, 1953 until its reactivation for the Proving Ground this year.

Fort Huachuca has contributed greatly to the success of American arms in all our conflicts since frontier times, and it will continue to do so as it begins a new chapter in its history as the Army Electronic Proving Ground.

RESEARCH

and the Electronics Industry

by Rear Admiral Frederick R. Furth, USN
Chief of Naval Research

At a recent RETMA meeting held before the IRE Convention, Admiral Furth delivered this important talk emphasizing the need for "basic research" in industry—a hard point, dollars and cents wise, to drive home to boards of directors and stock holders, but the core of our future industrial security. Here are excerpts from the talk.

THE STATURE OF THE ELECTRONICS INDUSTRY TODAY IS rightly a source of pride to all of us. More than that, it is a source of strength and security to the Nation and the entire free world. To our Armed Forces the products of the electronics industry have become an absolute necessity. To all of us the continued health and success of the electronics industry is a vital concern. To maintain this health and success, it is essential that this Nation sustain its technical superiority by a vigorous research and development program.

* * *

It is no accident that the stimulus to research provided by a great war effort, and sustained since then as never before in peacetime, has taken place at the same time when the electronics industry has advanced successfully from the cradle to its present condition of strength and prosperity. The momentum which this evolution has attained must be preserved in this critical period of world affairs! The research and development programs of the Defense Department are designed to keep this progress rolling. These programs not only need the direct participation of industry, but also the support derived from parallel research programs planned and fostered by industry itself.

It is gratifying to observe the widespread recognition by industry of the need for so-called "pure" research to sustain long-range scientific progress. This type of effort, which probes and extends the frontiers of human knowledge, sometimes appears—for example, to the sales-minded—to be an unrewarding investment. It is true that it cannot be expected to produce a yearly discovery comparable to the transistor. Nevertheless, it is only from such free scientific investigation that the really significant forward strides do come. When such "breakthroughs" occur, sometimes quite unexpectedly, the results can spread and multiply to the advantage of all who seize the opportunity. We confidently expect today's fundamental research in solid-state physics, for example, to produce results which tomorrow will broaden the whole future of electronics.

The field of applied research, verging as it does directly upon the area of engineering development, is of more obvious concern to the electronics industry. Here the advances made by modern technology rise from foundations prepared by pure science and proceed to practical and often spectacular results.

Let us briefly examine a few promising areas of research to which we may look for future progress in electronics.

Not so long ago, Dr. Bloch of Stanford University and Dr. Purcell of Harvard were jointly awarded a Nobel Prize for their study of the phenomenon of nuclear magnetic resonance. As we all know from observing tops and gyroscopes, a spinning body, when subject to forces which tend to reorient the spinning axis, exhibits the behavior called precession. If the external forces and the internal spin are held constant, this precession exhibits a definite repetition rate. The same is true of atomic nuclei. These may be regarded, for many purposes, as minute spinning tops with built-in bar magnets oriented along the spin axes. When such nuclei find themselves in a magnetic field, their situation is similar to that of the precessing gyroscope. The external reorienting forces are the same as those which tend to line up a compass needle in the earth's magnetic field. Collectively, then, the nuclei

by virtue of their precession have the nature of a dynamic system, the motion of which is characterized by a fixed oscillation frequency. Now, as natural objects go, the nuclei are very symmetrical. Moreover, they are effectively shielded in a symmetrical way by their associated atomic electrons. They float and precess freely in relative oceans of empty space. Hence, when the collection is regarded as an oscillator, it is an oscillator with extremely low friction or, as we have the habit of saying, extremely high "Q".

What possibilities does this phenomenon offer us for electronics? Three applications come to mind: (1) it is possible to produce radio frequency filters having extremely high "Q"—on the order of a million; (2) devices can be built to detect and measure magnetic fields ranging in intensity from those so weak they cannot be detected by other means, to fields of extremely high intensity—very handy features in geophysical prospecting for oil or minerals; and (3) memory devices can be built for the storage of pulsed signals in computer applications. These three practical results of fundamental research have already received considerable attention. They are probably only the beginning of a series of useful applications of this single post-war research item. . .

Most advances in the uses of electronics usually are associated with electron tubes having new or modified operating characteristics. The tube "art" is indeed the heart of electronics. But it must be transformed from an art to a science if we are to insure continued progress. Those concerned with electron tubes must enlarge their knowledge not only of the basic phenomena underlying the physical laws which determine electron-tube operating characteristics and the physical properties of tube materials, but also of the manufacturing processes and construction techniques. Further progress in expanding the usefulness and reliability of tubes now demands that we study the complex processes which occur during tube production. A knowledge of the nature and amount of all contaminants evolved in tubes during the various stages prior to delivery is necessary if we are to control their effect on tube operation and life expectancy. . .

Studies now in progress are directed toward determining the effects of pulsed and saturated emission on the fundamental properties of cathodes, the nature of the surface barrier, and the relative merits of surface activation versus body activation. Adaptation of an improved impregnated-type cathode to magnetrons and klystrons is expected to minimize the arcing and sparking difficulties now associated with the use of those devices.

. . . Work has been started on the design of a receiving-tube structure having an optimum form factor which will be capable of high-speed automatic production. A high degree of electrical and mechanical uniformity, together with reliability under extreme environmental conditions, is the object of this work.

* * *

. . . In 1947, the late Dr. William W. Hansen of Stanford University proposed the development of a high-power klystron amplifier which would be capable of producing pulsed powers of 35 megawatts or more at S-band frequencies. What Hansen aimed for was a micro-wave power source to drive a linear accelerator for the production of electrons with an energy of one billion electron-volts for nuclear research. . . Hansen's plan was to drive the linear accelerator with a series of high-power klystrons operated as amplifiers. The office of Naval Research supported this klystron and linear-accelerator work. I am happy to report that the klystrons have achieved better than 35 megawatts of pulsed power output! The linear accelerator itself has already produced 600 million electron-volt electrons with the klystrons running only at reduced power. Dr. Hansen's objective will soon be realized. The accelerator is now being operated for nuclear research. It is reported to be performing reliably with very little "down" time. The results of this work have been passed on to industry in a series of conferences and by publication in the technical journals. The outcome is that a very rapid transition from university laboratory to tube manufacturer has put some versions of these high-power klystrons quickly into production status.

I think this example not only illustrates how industry has met a challenge by exploiting new scientific advances quickly, but also points out the role Government can play in acting as a catalyst to accelerate the exploitation of new scientific information. Without Government sponsorship of the high-power klystron work it would undoubtedly have taken much longer for the klystron to reach its present state of development.

Field emission is an electronic phenomenon which for many years has given much promise. It has not found practical application up to the present time because of instability and a tendency to arc. Remedial measures could not be taken because of a lack of understanding of the basic physical principles involved. Recent research has yielded much of the required knowledge. Dr. W. P. Dyke and his associates at Linfield College have recently demonstrated that pulsed field emitters may operate stably for long periods of time. Experiments thus far show remarkable stability in these emitters in 100-hours tests. The current densities from such emitters are approximately one hundred million amperes per square centimeter. This is over one million times the number of electrons which can be boiled from the presently used thermionic emission cathodes. The emitter shapes used in these experiments are needle points. This means that they are dimensionally advantageous for sub-millimeter-wave amplifier and oscillator cathodes. The laws of nature are particularly kind in the case of the field emitter in that the emission is space-charge stabilized at a rate just below that which would produce melting of the emitter materials.

"Basic research leads to new knowledge. It provides scientific capital. It creates the fund from which the practical applications of knowledge must be drawn. New products and new processes do not appear full-grown. They are founded on new principles and new conceptions, which in turn are painstakingly developed by research in the purest realms of science."

—Dr. Vannevar Bush

Space-charge stabilization has an additional beneficial effect of great importance since it permits parallel operation of emitters from a single voltage supply. In other words, not only is the potential current density exceedingly large, but the total current can be built up to any desired value. Basic research in field emission appears to be near the stage where the electronics industry might seriously consider incorporating it in its own applied research programs.

* * *

Recognition of the strategic nature of natural mica for the electron-tube industry led the Armed Forces to support a research program at the Bureau of Mines for the synthesis of mica sheets. One of the most interesting and promising developments of this program has been the production of a synthetic polycyrstalline mica-ceramic material. This material is now being produced on a pilot-

(*Continued on page 78, col. 1*)

Our GROWING

Jet Traffic Problem

by Brigadier General Thomas L. Bryan, Jr.,USAF
Commander, 1800th AACS Wing, MATS
Tinker Air Force Base
and
President, Tinker-Oklahoma City Chapter, AFCA

ONE OF THE RESPONSIBILITIES OF THE 1800th AACS Wing is to install and operate the military navigational aids and air traffic control systems for the Air Force within the continental limits of the United States.

These facilities include control towers, approach control, GCA and DF stations plus all the necessary ranges, beacons, and various navigational aids needed to support the air traffic control system.

In addition, AACS is responsible for the support, in a communications sense, of all strategic and tactical missions of the Air Force. AACS fits into the national air traffic control picture for the military pilot in the same way that the Civil Aeronautics Administration and the Commercial airlines communications systems fit into the civilian aviation picture. In the continental United States, AACS is responsible for terminal control of military air traffic. Overseas, AACS acts as the control agency for enroute and terminal traffic, as well as performing the "company" communications missions.

Our air traffic control job has always been a difficult one because of the varied situations that develop within any air movement situation due to weather, emergencies and possible failure of ground and airborne equipment. With the advent of the jet airplane, the air traffic control people were faced with a new and even more complex problem. Conventional aircraft posed many control difficulties, not the least of which was the Berlin airlift. This situation was finally whipped by assuming complete control of all air movement factors. Pilots were told how to take off, when to take off, how fast to fly, what kind of approach to make and how to taxi at the end of the run. Because of the traffic, and the split second timing vital to the success of the lift, many of the pilots' prerogatives were shifted to AACS.

With the present situation involving "mixed" traffic — jets, heavy transports, slow aircraft and large bombers interspersed, it may be that a modified "Berlin" system is the ultimate answer.

Stop and consider some of the differences in the characteristics of jet and conventional aircraft, some of which border on the fantastic, and all of which affect, in some way, the air traffic control problem. These differences include rate of climb, rate of descent, high cruising speeds and high altitudes. These factors are almost the exact opposite of those of conventional aircraft. Other factors are higher takeoff speeds and landing speeds, higher fuel consumption (for instance, in one type of jet, 100 gallons of fuel means five minutes' flying time at 1000 feet, but 35 minutes' flying time at 45,000 feet), weather conditions and alternate airports. Due to the critical problem of fuel load versus fuel consumption, sometimes two and even three

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General Bryan ranks as one of the top electronics experts in the Air Force. A veteran of 24 years' service, he has been engaged in communications work since 1942 when he commanded the Radar School at Boca Raton, Fla. Prior to assuming command of the 1800th AACS Wing, he commanded the 10th Air Division (Def.) in Alaska.

alternates must be planned for jets.

Another important factor is the critical range of jet aircraft. Tactical personnel must plan missions that take a bare minimum of fuel reserve in order to realize full utilization of such aircraft in tactical missions. In some cases, an unplanned go around could mean trouble.

Straight-In Approach

In the opinion of AACS, the easiest method of letting down into an airport is the straight-in approach from altitude. This is especially true in the case of pilots flying "hot" airplanes under IFR conditions, where the minimum number of turns is required. In addition, this method is the most economical. Standardizing such an approach is difficult, but AACS is striving toward a simplified method, taking into consideration locations of navigational aids and airspace restrictions.

Not the least of the controller's problems in relation to a straight-in approach is that of approach over metropolitan areas such as New York. For example, how can a jet be cleared for a straight-in approach from 40,000 feet, 60 miles out from destination, if that airport should happen to be New York, Cleveland, San Francisco or Kansas City? How would the other traffic in the area be handled? What if contact with the jet should be lost, after he had been cleared down through the assigned altitude of practically every airplane in the area? This is why the progress is slow and tedious.

The big problem, and the most unsolvable, is that of sufficient airspace in the United States. If sufficient airspace were available, key navigational aids could be installed around a given airport at an adequate distance to allow jet aircraft to start descent from 40,000 feet, and let down straight into landing. Naturally, the expense of such a system would be prohibitive. The obvious answer to this problem would be the establishment of specific air corridors or areas for jet aircraft, and other areas for conventional aircraft. This method has been employed, but the system will not work in the area of terminal airports, where routes are at a premium.

Another problem that poses itself is the limitations of our present navigational facilities at high altitudes. Definite difficulties can be foreseen at altitudes above 40,000 feet. For example, what is the width of the cone of a low frequency range station at 40,000 feet and above? Would the pattern of a fan marker placed ten miles out from the range station "Z" marker interfere or overlap the "Z" marker pattern? Does the configuration of the range leg remain the same at high altitudes? How does VOR work at such altitudes? AACS has all these problems under careful evaluation at present. All possibilities are being exploited, and these possibilities may dictate a resurvey and relocation of many of our facilities.

There is no magic formula that will solve all of the difficulties in the field of air traffic control, but AACS is moving in the right direction.

The immediate steps toward solution of the problem are those of developing and establishing radar and radar systems to aid the controller in handling air traffic. Until all the new "gimmicks" are installed, the best method is the wise employment of the systems now in use.

AACS is in the process of establishing approximately 50 radar air traffic control centers in the United States. These centers are composed of terminal radar capable of high altitude coverage to approximately 20,000 feet with horizontal coverage of approximately 40 miles radius, and precision radar capable of handling two or more airplanes on the final approach simultaneously. Long range radar is being installed in some locations, capable of high altitude coverage, and a radial coverage up to 200 miles. All of this radar equipment is consolidated within a

single room, allowing centralized control of the entire system.

AACS believes that radar is best used as the primary means of approach control. This belief is based on the need for simplifying the work of the jet pilot. This does not mean that radar itself is a complete system. Only by proper placement and utilization of all facilities in the area can an efficient system be accomplished. However, radar does simplify the entire picture.

With the proper radar system, a jet can be picked up 40 miles away at altitude, and brought to a landing without utilizing any other navigational aid. But there is a limit to the number of aircraft that one operator can control. Because of this, a combination of navigational aids is used, in order to provide the widest safety factor as a backup.

It is planned to use automatic ILAS (instrument landing approach system) and GCA (ground control approach) in conjunction with our RATC (radar air traffic control) centers to speed up approaches and reduce the work load on the precision radar operators.

ILAS has been found invaluable in the event of radar failure in that the pilot can divert his attention to working the ILAS, and continue his approach normally.

Radar is not infallible, but it's still the best instrument at hand.

One problem that besets radar control of jet aircraft is the small reflecting surface of the jet. Jets are difficult to see on the radar, and they travel at high speeds, making tracking difficult. One solution to this problem is an airborne responder that intensifies or increases the size of the blip. Care must be exercised in controlling aircraft equipped with a responder at long range and at great altitude, because the fact that the aircraft can be seen on the scope sometimes lends false security to the observer, in that other non-equipped aircraft are in the same area, but not on the scope.

Looking into the future, here is a rundown on some of the systems that are in the mill.

GCA vs. ILAS

An old saying "differences of opinion make for horse races" has been around for a long while. Back around 5000 B.C., Ug, who had always dragged his wife along by the hair, disagreed with Pog, who favored dragging his wife by one foot. Both methods gained the same end, that of getting the missus to the point of termination, albeit slightly ground weary. During the middle years of aviation, many beers and much wind were expended in furthering or refuting the theory of control surface action in a vertical bank (if you are in a vertical bank, does the elevator act as a rudder, or vice versa?). Today, there is much hanger-yak centering around the comparative value of ground controlled approach (GCA) and instrument landing approach system (ILAS). Both are used by the Air Force. Note the term "approach". Neither of these systems is a blind landing system—yet. Blind landings, however, are the goal of both these systems, which are still in the process of development, and which still depend to a great extent on lighting design and runway length.

Automatic GCA and automatic ILAS are refinements of the respective systems. Both are aimed at completely automatic approaches and much progress has been made in each system. No doubt when both are perfected there will still exist the same old argument as to which system is best. I, for one, plan to wait and see, while urging the development and utilization of both systems.

Air Force personnel on duty in the control tower of a busy air base are constantly working with the present day aircraft traffic problem, but modern electronic instruments have helped to solve it.

Pictorial Computer

The CAA Technical Development and Evaluation Center is presently working with a new computer which is capable of plotting an aircraft's track over a given map area. The equipment can be mounted on the instrument panel of the aircraft or, in the portable version, can be placed in the pilot's lap. The pictorial computer utilizes information from the distance measuring equipment and the omnirange receiver and continuously indicates on a chart the position of the aircraft with respect to the omnirange station. This type of equipment may well be one of the answers to the jet navigational problem when the equipment is perfected.

These new systems or aids will probably prove very useful in the future and are adapted to inclusion into our present systems. I believe completely automatic flying and automatic systems are not too very far away; however, we can and should do everything possible to refine and modify our present systems to meet our more immediate needs until we do change to this automatic status.

We in the Air Force are extremely distressed by the increasing number of mid-air collisions. Today's modern airplanes with all their knobs, handles, levers, gauges, dials, hydraulic systems, electrical systems, etc. are masterpieces of ingenuity and genius. Their increasing speeds are virtually changing the meaning of space—space as the old pilots knew it 20 or 30 years ago.

AACS is doing everything it possibly can to solve air traffic control problems. AACS works constantly with CAA and other agencies in attempting to devise streamlined, safe air traffic control procedures which will benefit all concerned.

Any ideas you may have on this subject will be welcome. We can progress in this field only if all agencies work together and pool their "know how" in this business whenever the opportunity arises.

First of two parts

by Margaret P. Haskin

Catching Up with Specifications, Standards & Qualified Products Lists

The Specifications and Standards branch of the Bureau of Ships saw the need for further explanation to commercial concerns of the Government's buying methods. This first section, dealing only with specifications, sets down all the general data that industry should know about them.

FEDERAL AND MILITARY SPECIFICATIONS, COMMONLY REFERRED to as "Government" specifications, are of concern to everyone having material, equipment or services to offer to the Government under contract.

It should be noted that nationally recognized industry and technical society standards and specifications are used to the greatest extent possible in the development of these Federal and Military Specifications. Playing such a large part in the development of this program, manufacturers should be vitally concerned with whether or not they can furnish materials under these specifications—equipment designers with whether or not materials and parts covered by these specifications are suitable for use in designing equipment for the Government. In addition, taxpayers should be concerned with the economic aspects of these specifications—whether or not they are really getting their money's worth in equipment purchased by the Government.

An effort is being made to reduce the number of specifications necessary for government procurement. As the first step towards accomplishing this, specifications used by the military departments are being limited where possible to two main series, the Federal and the Military. Individual activity specifications, such as those in the old Navy Department series, are being combined and incorporated into the Federal or Military series as rapidly as possible.

What is a Specification?

A specification is intended to be a clear and accurate description of the technical and physical characteristics or performance requirements of the material or equipment, including the preparation for delivery, and procedures by which it can be determined that the requirements have been met.

Federal specifications (originally known as U. S. Government Master Specifications) cover supplies and materials of interest to and in common use by two or more government departments, at least one of which is civilian. These specifications are administered by the Director of Federal Supply, General Services Administration.

Federal specifications are identified by a symbol composed of three parts as follows: (a) An arbitrarily assigned single, double, or triple letter indicates the Federal "Group for Procurement." Actually this is an alphabetical classification system. Examples of this group are: H—Brooms and brushes; FF—Hardware, and LLL—Wood Products. (b) A single letter which is the first letter of the first word in the title; and (c) A serial number determined by the alphabetical location of the title. Examples of identifying symbols of Federal specifications are: H-B-695—Brushes, varnish, flat; FF-P-101—Padlocks; LLL-B-636—Boxes, fiber, solid (for domestic shipment).

Three Types of Federal Specifications

Federal specifications are of three types. The first, *regular (coordinated)*, are those which have been circulated and approved for use by all interested Government departments. *Interim* specifications are developed and issued by an individual Government agency to satisfy an immediate need. They are mandatory for use by the specific agency or agencies indicated in the preamble but are optional for use by other Federal agencies. Interim Federal specifications are intended for final processing as regular Federal specifications, and, prior to coordination, are identified by the basic symbol prefixed with double zero (00) and carry a suffix to identify the issuing activity. Example: GG-G-00191 (Navy-BuMed)—Generator, Ultraviolet, Physiotherapeutic.

The preamble, which is located on the first page of interim Federal specifications directly under the title, explains the significance of the specification. In cases where it is intended that the specification when coordinated will super-

sede an existing regular Federal specification, this will be so indicated in the preamble. The following is an example of preambles used in Federal specifications:

> "This interim Federal Specification has been developed by the Navy Department, Bureau of Ships, based upon currently available technical information. It has not been approved for promulgation as a revision of Federal Specification GGG-J-51a dated 9 September 1942, and is subject to modification. This specification is in interim form only, and, pending its promulgation as a regular Federal specification, it may be used in procurement."

The third type, *emergency*—is designed for the primary purpose of conserving critical materials. They carry the same number as the basic specification; however, the basic number will be prefixed with a zero. Emergency Federal specifications do not modify or supersede the basic specifications, but are issued in addition thereto, to be used as an alternate whenever possible to effect conservation. Example: H-B-0256a, 15 May 1951.

When emergency specifications are used, a "Notice" is published calling attention to the optional specification and the material it is intended to conserve. The notice carries the same symbol (number) as the basic specification and underneath this symbol appears the number and date of the notice. Notices to a particular specification will be numbered consecutively using Arabic numerals beginning with number 1. Thus the second notice to H-B-491b has a symbol and number in the upper right hand corner of the heading as follows:

H-B-491b
April 3, 1945
NOTICE 2
November 14, 1951
SUPERSEDING
NOTICE 1
October 5, 1951

A revision of a Federal specification supersedes entirely the previous issue including any amendment thereto. Revisions are indicated as follows: (a) Regular—Revisions to regular Federal specifications are indicated by the addition of a small letter—a,b,c, etc.—to the symbol in the upper right hand corner of the first page. Example:

QQ-B-746a
8 October 1950
SUPERSEDING
Fed. Spec. AA-B-746
June 5, 1943

(b) Interim—Several different methods have been used to indicate revision of interim Federal specifications. Among these methods are superseding by date only, and the use of revision letters described for regular Federal specifications.

Minor changes in a Federal specification are made by amendment. Amendments bear the specification symbol, the amendment number, and the date of the amendment in the upper right-hand corner. Only one amendment is in effect at any one time; subsequent changes in the specification are made in a superseding amendment that includes all changes to the date of its issue. Superseding amendments are indicated by the figure "2", "3", etc. Example:

J-C-103
Amendment-5
27 May 1950
SUPERSEDING
Amendment-4
April 4, 1947

Military Specifications Explained

Military Specifications, formerly known as Joint Army-Navy (JAN) Specifications, cover those materials, products or services used solely or predominately by military activities. While the use of these specifications is required only by military activities, they may be used by other Federal agencies if desired.

Complete List of Suffixes for Identification of Limited Coordination Specifications

Army

CmlC—Chemical Corps
CE—Corps of Engineers
Med—Army Medical Service
Ord—Ordnance Corps
QMC—Quartermaster Corps
SigC—Signal Corps
TC—Transportation Corps

Air Force

USAF—Dept. of the Air Force
ASG—Aeronautical Standards Group

Navy

NAVY—Dept. of the Navy
MC—Marine Corps
Aer—Bureau of Aeronautics
BuMed—Bur. of Medicine and Surgery
NOrd—Bur. of Ordnance
Pers—Bur. of Personnel
Ships—Bur. of Ships
S&A—Bur. of Supplies and Accounts
Docks—Bur. of Yards & Docks

The Office of Standardization directs efforts of the military departments in the Department of Defense standardization program. The purpose of this program is to attain the highest degree of practical standardization of all items of material used by the armed forces. The part of the program pertaining to Military specifications and standards is being directed toward the following objectives:

(a) Determination of the least number of types or kinds of items required to fulfill the needs of the armed forces.

(b) Attainment of the greatest practical degree of uniformity and interchangeability in the component parts of such items.

(c) Attainment of the highest practical degree of standardization in processes.

d) Establishment of standards and specifications to insure purchase of only such items as meet those requirements essential to the armed forces.

(e) Use of uniform terminology and definition of technical and engineering practices and principles.

To carry out these objectives, it is intended that Military specifications when issued shall cover military requirements insofar as technical developments and current industry practices permit. Change to specifications will be made whenever warranted by engineering and scientific progress, by experience in manufacture, or by experience in the use of the item covered. Under this policy, no Military specification is to be considered as final or restricting or stifling technical development and improvement of design. However, it is not the intent to delay issuance of coordinated specifications pending the results of investigations or tests intended to refine the item above and beyond what it required for the intended use.

Military specifications are of two types, *coordinated* and *limited coordination*. Coordinated specifications are concurred in by all interested activities of the three military departments and cover items of common use. Limited coordination specifications are those of single departmental interest or those prepared by a department or activity to satisfy an immediate procurement need.

Coordinated specifications are identified by a symbol composed of three parts; the letters "MIL" (abbreviation for military) followed by a single letter, which is the first letter of the first word in the title, and a serial number. For example, the symbol for the specification covering chair, wood, steamer type, is MIL-C-(for the word chair) 852 (serial number). As existing specifications carrying the prefix "JAN" are revised, the prefix is changed to "MIL" although the number remains the same.

Limited coordination specifications are identified by a suffix to the basic symbol. This suffix identifies the activity issuing the specification. For example: MIL-C-852(SHIPS). If a limited coordination specification later becomes fully coordinated, it will be identified by the same basic symbol without the suffix.

In some cases where a coordinated specification of general

use becomes obsolete and revision is delayed, it may become necessary to issue a "limited coordination" specification to cover changes required for immediate use. To avoid the confusion caused by issuance of a limited coordination specification of the same title under a new number (and later reversion to the original number) a limited coordination specification may be issued under the original number. These limited coordination specifications, in addition to the regular identification, will carry the notation "Used In Lieu Of" where the supersession information is ordinarily carried. In addition, the symbol will be prefixed with a double zero (00).

MIL-R-0016847C(SHIPS)
6 March 1953
Used In Lieu Of
MIL-R-16847B
11 July 1952

Where a specification has the words "Used in Lieu Of" in the superseding data, its use by the issuing activity is mandatory. The coordinated specification is retained as active for activities not desiring to use the limited coordination specification until it has been completely superseded or cancelled.

Revisions of Military specifications are indicated by a capital letter following the symbol and preceding any suffix. The first revision will be marked with the letter A and succeeding revisions will be marked by the other letters in alphabetical sequence, except that the letters I, O, Q and S will not be used. For example: MIL-W-17000A or MIL-W-17000B(SHIPS)

As in the Federal specification series, minor changes to Military specifications are made by amendment. Amendments bear the specification symbol, the amendment number, the date and any supersession notice in the upper right hand corner. Amendments are cumulative and only one amendment is in effect at a time for a specification.

Custodian for Military Specifications

A custodian from each of the military departments (Army, Navy and Air Force) is designated for each specification. In general, custodianship is based upon the technical responsibility for the items, material or services covered by the specification and the assignment is made to a technical service or bureau. The custodians are responsible for insuring that the requirements of the specification will satisfy the needs of their departments. Custodianships are shown on the last page of the specification by listing the complete name of the Department of the Army service, Department of the Navy bureau, or Department of the Air Force. In addition, other interest within the Army and the Navy is shown by listing the appropriate bureaus or services by symbol or initial. For example:

Custodians:
Army—Ordnance Corps
Navy—Bureau of Ordnance
Air Force
Other Interest:
Army—EST
Navy—AOSY

Questions concerning Military specifications listed in a particular contract should be referred to the purchasing officer. Questions concerning Military specifications where a contract is *not* involved should be referred to the appropriate departmental custodian, or interested bureau or service, as indicated in the specification.

The format of Federal and Military specifications is essentially the same. They are divided into six general sections, with a seventh added for Federal specifications. The first section, "Scope and classification," contains general information pertaining to the extent of applicability of a product or service covered by the specification, and when necessary, specific detailed classification breakdowns. In the second section, "Applicable specifications, other publications, and drawings," is listed the documents referenced in the specification, together with information as to where copies may be obtained.

"Material requirements," the third section, contains essential requirements and descriptions applying to the material or product covered by the specification. These requirements and descriptions cover in detail the character or quality of the materials by specifying the formula, design, construction, performance, physical requirements, dimensions, weight, and color, as necessary. This section is intended to indicate, as definitely as possible, the standard of performance, quality, and workmanship which the commodity must meet to be acceptable. Where qualification approval is required, this section will contain a statement to that effect.

Section four, "Sampling, inspection, and test procedures." includes information about these procedures as applicable. Complete and detailed information is provided concerning the methods and frequency of sampling, inspection, and tests to determine conformance of products presented for acceptance under the specified requirements.

The fifth section, "Preparation of delivery," covers the requirements for preserving, packaging, and packing of the item, including the specific requirements for materials to be used.

In section six, "Notes," information of a general or explanatory nature which is not properly a part of the preceding sections is stated. This information includes use or application notes and detailed information to be incorporated in invitations for bids, contracts or other purchase documents.

The Author

Miss Haskin has had eleven years' experience in the Specifications and Standards branch of the Bureau of Ships, and is now assistant chief of the branch. In recent years, she has worked closely with the Office of Naval Material and the Standardization Division, Office of the Assistant Secretary of Defense (Supply & Logistics), as well as with Government agencies, both military and civilian, concerned with specifications, qualified products lists and standards.

Procurement of Indexes and Specs

The seventh section is included in Federal specifications only and pertains to the requirements that are special for individual departments. These "Special requirements" are intended to take care of the administrative problems caused by the variety of uses for the item among the various government departments.

The index issued by General Services Administration as "Index of Federal Specifications and Standards" is a complete listing of all Federal specifications and standards issued under the auspices of GSA. Copies of this index, and monthly supplements thereto, may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. The cost is on a subscription basis and includes the cumulative monthly supplements issued during the calendar year.

Copies of Federal specifications may be obtained upon application, accompanied by check, to the General Services Administration, Business Service Center, Region 3, 7th and D Streets, S. W., Washington 25, D. C. Single copies of Federal Products Specifications required for bidding purposes are available without charge at the GSA Regional Offices in Boston, New York, Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, Seattle, and Washington, D. C.

The military index of specifications is divided into four volumes. However, Volume I which was issued by the Munitions Boards Standards Agency has been temporarily discontinued. The other volumes are as follow: "Index of Specifications and Standards, Used by Department of the Army, Military Index, Volume II"; "Index of Specifications and Standards, Used by Department of the Navy, Military Index, Volume III," and "Index of Specifications and Related Publications, Used by Department of the Air Force, Military

(*Continued on page* 74, *col.* 1)

Second of two parts

CIVIL WAR SIGNALS

In the previous part of this talk which Dr. Thompson delivered before the Washington, D. C. Civil War Round Table, the communications setup of both the Union and Confederate armies through the first big battle of the War, Bull Run, and the personnel who influenced the development of the Signal Corps is thoroughly explained. To continue the story . . .

by Dr. George Raynor Thompson

Chief, Signal Corps Historical Division

THROURHOUT THE WAR, AFTER THE Bull Run fiasco, Myer and his signalmen provided visual signals along march routes, in campaigns and in encampments wherever and whenever needed. In the watch along the Potomac and during the Maryland invasions Myer set up valuable wigwag stations, as at Maryland Heights overlooking Harper's Ferry, at Point of Rocks along the river, and especially atop Sugar Loaf Mountain in the valley of the Monocacy.

Messages could and often did pass day and night by rapid signaling and efficient relay over the lines of Myer's aerial telegraph to and from Washington. These elevated stations and the telescopes of the signal officers of course provided invaluable observation services. Again and again during the Maryland campaigns of 1862 and 1863 Confederate movements were discovered through the glasses of Signal Corps observers. Thus was discovered Lee's first crossing of the Potomac in 1862. The approaches and fords of the river were closely watched by Lieutenant Miner, atop Sugar Loaf. Miner stayed at his post, determining and reporting the Confederates' objectives until he was captured by the advancing troops.

Some days later, during the battle of Antietam on 17 September 1862 a signal station on Elk Mountain gave valuable service. The Signal Corpsmen scanned the field and in particular aided the fire of Federal batteries. The value of their observations and wigwagged messages were noted by a correspondent of a Richmond newspaper. He wrote that Lee's Confederate troops "could not make a maneuver in front or rear that was not instantly revealed by keen lookouts; and," he wrote on, "as soon as the intelligence could be communicated to their batteries below, shot and shell were launched against the moving columns. It was information," he explained, "conveyed by the little flags upon the mountain-top that no doubt enabled the enemy to concentrate his force against our weakest points and counteract the effect of whatever similar movements may have been attempted by us."

This Beardslee magneto-electric telegraph instrument, made in 1862, was recently photographed in Washington. At the time of its invention, Major Myer was greatly impressed with its efficiency and ease of operation.

Signal officers Herzog, Gloskoski and Camp kept the Union generals well informed during the battle. In the afternoon, General Burnside, becoming concerned over a maneuver of the Confederates before him, had a message wigwagged to the mountain station asking that the signal officers scrutinize the area in question. Gloskoski soon signaled back, "Look well to your left. The enemy are moving a strong force in that direction." It was this message that enabled Burnside to take timely steps against a reinforcement which General A. P. Hill was bringing from Harper's Ferry.

When Jeb Stuart's Confederate cavalry swept through Maryland a few weeks later, the officer at Point of Rocks signal station, Lieutenant Fralich, detected and reported his crossing back to Virginia on 12 October 1862. Stuart's daring raid into Maryland had been a gamble with the hilltop signal posts. Douglas Freeman, author of *Lee's Lieutenants*, described these Federal flag stations as "well placed." Freeman noted too that Stuart's raiders on their way north had taken pains to avoid observation (especially in the vicinity of Sugar Loaf) and had sought out obscure roads and the cover of woods. But as the Confederate cavalry returned south, the signal officer on Sugar Loaf sighted them. Very early on the morning of the 12th he wigwagged " We can see a heavy body of troops near Hyattstown." But he failed to report their identity till nearly noon when he wigwagged again stating that the troops were Confederate.

While visual signals, the flag and torch, were thus proving their worth, Major Myer stubbornly fought for electric telegraph lines in the field. He insisted upon the need for temporary lines, close to battle, under military compulsion and control, controlled in short by the Signal Corps. Visual signals obviously could not be used in murky weather, or in heavily wooded flat terrain.

As early as the summer of 1861 Myer asked for and got authorization to purchase what he called a telegraph train, that is, wagons loaded with telegraph especially designed for the purpose of providing quick temporary wire lines in the field. Myer described the train as the "flying" telegraph. (A drawing of this "flying" telegraph appeared with Part I of this story in the March-April 1954 issue of SIGNAL. Ed.) He drew up specifications for the equipment: hand-carried reels bearing several miles of light wire; light-weight lance poles, iron shod and fitted with insulators; telegraph sets and tool kits. This was a Signal Corps innovation and experiment. Myer pushed it with conviction and determination. He accomplished it in the face of apathy and opposition, especially on the part of the civilian telegraphers. The operators jealously guarded their skills and the telegraph companies were concerned to keep all telegraph activities to themselves.

Signal corpsmen often built very ambitious towers where high land elevations were lacking and where operations became more or less stable. Here is one built on Cobbs Hill, on the Appomattox, during the siege of Petersburg in 1864. It reached a height of 125 feet (another tower on Peebles Farm in this campaign went up to 145 feet). Towers were often the objects of cannon fire but were hard to hit. With a two-gun battery a mile from this tower, the Confederates never prevented its use, let alone caused its destruction.

As for technical difficulties confronting Myer, the chief obstacle arose from the fact that the established commercial type telegraph required heavy, complicated storage batteries and skilled Morse code operators. Combat conditions, then as now, called for equipment as lightweight as possible, as simple and rugged as possible, and easy enough to operate so that relatively unskilled soldiers could use it. Yet the first of Myer's flying telegraph trains, delivered in January 1862, was not so simple as Myer wished. The train employed storage batteries and Morse code keys and sounders all of which called for skilled operators.

Myer persisted in seeking something better suited to military limitations upon weight and skill. Early in 1862 he believed he had found the solution. It was a new piece of telegraph equipment, the Beardslee magneto-electric telegraph instrument. The device was developed by George W. Beardslee of New York, specifically as a portable telegraph, especially intended for military use. The instrument required no batteries. It employed magnetos which generated current when hand-turned, like the ringers on army field telephones or on old-fashioned civilian phone boxes. As Myer himself described the device: "its working current . . . when placed on a telegraph line is generated by a pile of magnets, a part of the instrument itself. The letters of the alphabet are plainly marked on the dial. To cause the letters to be indicated at either end of the line, or to read them, are operations so simple as to be within the power, with little practice, of almost any soldier who can easily read or write. The instrument is used without fluids, without galvanic batteries of any kind, and is compact, strong and portable."

A flying telegraph train equipped with these new instruments and with several miles of wire coated with gutta percha insulation reached the Union army during the Peninsular Campaign in 1862. Its first service began on 24 May when is provided a line from McClellan's headquarters to Stoneman's headquarters several miles away. Thereafter the new Beardslee telegraph instruments worked rather well within their limitations, despite much subsequent ridicule from advocates of the civilian telegraph.

For nearly three weeks this first Beardslee-operated wire line carried many dispatches. On one occasion Lieutenant Milton Benner, commanding the telegraph train, reported that he transmitted 18 messages, which averaged about 40 words each, in less than two hours. Benner felt certain and so did Myer, at this time, that the portable magneto field telegraph had passed its test and proven its practicability. Myer wrote on 5 July 1862 "I am satisfied with my trials on the instruments. . . ." He added, "Occasions must often occur with an active army when none but portable telegraph trains can be used." Such occasions had already occured in the flat woodlands of the Peninsula. They occurred again in the Fredericksburg campaign in December 1862.

Three Signal Corps telegraph trains equipped with the Beardslee sets accompanied the Federal Army to Fredericksburg. The trains were now commanded by the son of the inventor, Captain Frederick Beardslee. Myer first set up five visual wigwag stations along the north bank of the Rappahanock. Fog blanketed the area through the morning of 11 December hampering visual signaling. On the next day smoke from the burning town engulfed a wigwag station which had been set up in the Courthouse steeple. Meanwhile, the men of the flying telegraph trains were running wires from General Burnside's headquarters to the Federal left wing. Before dawn on 11 December Captain Beardslee and three men, carrying one reel of wire and 25 lance poles, extended the line across the river. Beardslee wrote his father on 14 December, the day after the main battle, saying that the wire lines had been of greatest service to General Burnside. The General, he wrote, "has often thanked us for the promptness

with which dispatches were sent and answers received and has one of his aides in our tent almost all the time to receive dispatches for him." Myer described the working of the field wire telegraph in this campaign as "superb."

But in the next campaign, in the spring of 1863, around Chancellorsville, the Beardslee devices and Signal Corps flying telegraph trains did not prove out so well. Myer attempted to explain failures on grounds that the insulated wire had deteriorated after months of rough usage. He also attributed failures to the fact that curious soldiers were continually cutting the insulated wire to see what it was made of. Actually, the Beardslee instrument was a short range device. It could not generate enough electricity to signal through more than a few miles of wire. It was of course no match at all for the established commercial type of telegraph, of the type represented by Myer's first battery-equipped trains.

And now the civilian military telegraph organization was adopting Myer's field telegraphic train procedure. Loading their batteries and Morse sets into wagons, along with reels of bare wire which they strung on hastily erected poles, they were increasingly providing field communications in competition with the Signal Corps, at longer ranges and with greater speed of transmission. In one case, a ten-mile line which the Signal Corpsmen had laid and worked with Beardslee sets proved so slow that General Hooker turned the line over to the military telegraphers, who connected their batteries and worked this Signal Corps wire line more effectively with their Morse keys.

Throughout the Chancellorsville Campaign, signals suffered in other ways also. Colonel Myer complained that he was not informed of battle plans and that his men were sometimes left idle. Reasons of security helped to cause visual flag and torch signaling to lapse. Visual signals, like modern radio, are of course readily intercepted by the enemy. The signals themselves reveal positions and they may even betray their messages if the enemy knows the cipher system. The Confederates did know it in early 1863. Myer explained that although he several times changed the wigwag cipher system, the enemy quickly solved the changes until the Union army adopted the cipher disc which Myer invented late in the war.

A civilian telegrapher, with couriers and helpers standing by, operating his Morse instruments atop a hardtack box in a field tent at Wilcox Landing, City Point, 1864. Notice the battery and wire wagon, with a reel of field wire, which stands out to the right.

Meanwhile fearing that the Confederates would intercept and read important dispatches, the Union generals actually ordered that wigwag signals be discontinued. Douglas Freeman, in his *Lee's Lieutenants*, took note of the bad Federal communications at Chancellorsville. He remarked that in addition to equipment difficulties, the generals were at fault in withholding information which would have speeded communications, and, in the case of General Sedgwick, confidence was lacking in the security of the signal service. The report of the signal officer at Chancellorsville, Freeman added, deserves more consideration than it has hitherto received from historians.

In the next campaign, up through Maryland to Gettysburg in June and July 1863, visual signals again played a large part. And in the great battle itself the Union chief, General Meade, quite in contrast with former Federal commanders, recognized the place of the Signal Corps in the military household. He called upon it, as upon other staff corps, to aid in the battle plans and he summoned Signal Corps officers to his war councils. Consequently, visual communications, flag and torch, received much use at stations as atop the Lutheran Seminary and along Cemetery Ridge. Signal Corpsmen occupied Little Round Top and opened communications with Emittsburg at 11.00 p.m. 1 July.

This signal station on Little Round Top leaped into utmost significance on the next day, 2 July. Captain James S. Hall, the signal officer stationed there, on the extreme left of the Federal line, was alone far into the afternoon. No Union troops were on the hill. Sickles' Corps in the foreground below the hill was being outflanked by Confederate units maneuvering unseen through the woods. That Little Round Top was a key position was not realized till late in the day; then both sides reached for it. General Warren, Meade's chief engineer, is generally given credit for saving Round Top from capture. Warren subsequently wrote that it was at his own suggestion that Meade sent him "to the left to examine the condition of affairs." But the accounts of Signal Corps officers indicate that it was messages of warning from the signalmen on Little Round Top which led Meade to send Warren. Nine years after the battle Warren wrote that he rode to the left "till I reached Little Round Top. There were no troops on it and it was used as a Signal Station. I saw that this was the key of the whole position. . ." He then sent a dispatch to Meade for the troops which would arrive barely ahead of the flanking Confederates. Soon the attack began. "While I was still all alone with the signal officer," Warren reminisced, "the musketballs began to fly around us and he was about to fold up his flags and withdraw, but remained at my request and kept waving them in defiance."

Colonel Benjamin Fisher, the acting Chief Signal Officer in the last year of the war, is shown standing in the center of the entrance to the Signal Corps headquarters at that time. The first Washington headquarters of the Corps, from November 1861 to May, 1954, still stands, little altered, at 1905 F Street, N. W., and is used by American University.

Whether or not Signal Corpsmen Hall had earlier wigwagged messages which led to the sending of Warren and troops to Little Round Top, it does appear that the very presence of the lookout and the conspicuous flag station had delayed the Confederates long enough to enable the Federals to seize the hill first. E. P. Alexander, now a Confederate General, later made this interesting comment. "That wretched little signal station upon Round Top that day." he wrote, "caused one of our divisions to lose over two hours and probably delayed our assault nearly that long." As Alexander explained it, he had been directed, in moving his artillery, to keep out of sight of the Signal Corpsmen on Little Round Top.

Meanwhile the use of the electric telegraph, the flying wagon trains equipped with the simple Beardslee instruments and operated by the Signal Corps, was precipitating a crisis. The first application in the Peninsular and Fredericksburg Campaigns had looked good. But thereafter it is evident there were disappointments. Even so, the Signal Corps ordered more trains built, some 30 in all. Five were assigned to the Army of the Potomac, four were placed in Signal Corps training camps and the rest were distributed among the several Departments.

The skilled civilians of the Military Telegraph were contemptuous of the Beardslee device, frictional electric telegraph they called it. Indeed, the new instrument had limitations of range and operation. The range was short and operation was slow. Further, if the devices at the two ends of a line fell out of synchronization, they garbled the messages. Myer himself recognized the limitations. But he could not obtain experienced Morse operators in the army. Besides, of course, the maintenance and transport of the wet batteries had their disadvantages in the field, as Myer well knew since his first telegraph train had included batteries.

But now, taking a leaf from Myer's telegraphic efforts, the civilian telegraph organization, the so-called Military Telegraph, was entering the field increasingly with portable Morse equipment. The situation confronted the Signal Corps with a crucial alternative. Either Colonel Myer would have to take over all wire telegraph in the field, whether Beardslee or Morse or he would lose wire telegraph operation altogether to the Military Telegraph, headed by Anson Stager, who reported to no general of the army but only to the Secretary of War himself, Secretary Edwin M. Stanton in Washington.

In September 1863, Myer made an effort to obtain experienced telegraphers by offering them commissions in the Signal Corps. At the same time he urged his officers in the Corps to resist any attempt to take away its wire telegraph trains and lines. The attempt came and was accomplished very soon. In the next month, Stager complained to Stanton of the embarrassment and trouble occasioned by the presence of two wire telegraph organizations in the field. On 10 November 1863 Stanton sided with Stager. Stanton ordered that all telegraph trains in the army be turned over to Stager and his Military Telegraph. At the same time Secretary Stanton relieved Colonel Myer as the Chief Signal Officer and put Major William Nicodemus in charge of the Corps, which was now limited to aerial, that is, visual, signals only.

The Military Telegraph organization never made use of the Beardslee instruments, though its civilian linemen did employ the insulated wire. Insulated wire of course was easier to lay than bare wire. It could be laid on the ground or along fence posts. Bare wire had to be strung on insulators on poles.

This is the central Signal Corps visual station in Washington, atop Winder's building which still stands on 17th Street and houses the Passport Division of the State Department. The man aloft holds the wigwag flag staff. Notice the man at the left wearing on his right coat sleeve the crossed flag Signal Corps insignia (torch added later).

The civilian employees of the organization henceforth accompanied the Federal armies and strung some 15,000 miles of wire during the war, laying out the lines and taking them up as the situation demanded. The civilian telegraphers, with their wagons, tents and instruments serving army and corps headquarters, came close enough to battle to experience all its dangers. Their routine labors were heavy. Stager estimated that the telegraphic traffic during Fiscal Year 1863 averaged 3,300 messages each day, some messages running to thousands of words. A number of the civilians performed extremely hazardous and valuable missions tapping Confederate wire lines in Confederate territory. A great many of the some 1,200 civilian telegraphers suffered casualties from disease, accident or enemy action. All this they did without the benefits of military service, not without some bitterness for their lack of reward. That they remained unrequited with military status, even when they took over the field telegraph of the Signal Corps, was the consequence, it seems, of Secretary Stanton's passion for civilian control, for control by himself.

Edwin M. Stanton before the war had been a director in, and an attorney for the Atlantic and Ohio Telegraph Company. He recognized the value of an extensive telegraph net and of strong control over it and he perceived the essence of security, of protecting the telegraphic code. He allowed no general, not even the President, to interfere. As a result the Union generals

(*Continued on page 77, col. 1*)

This group of military telegraph employees served General Grant at City Point, August 1864. Very striking is the youthfulness of these civilians to whom was instructed the telegraph code, denied to generals. At the far left, seated, is Dennis Doren, the Superintendent of Construction. Standing next to him is A. H. Caldwell, who served as cipher clerk in the headquarters of the Army of the Potomac through most of the war. Next to him stands James Murray, who engaged in the extremely dangerous business of tapping Confederate telegraph wires.

Multichannel Radio at Point M

by R. F. White
Naval Air Missile Test Center, Point Mugu. Calif.

and

A. P. Bowser
Lenkurt Electric Company, San Carlos, Calif.

INSTALLATION OF A MULTICHANNEL radio relay system to increase communication facilities between the mainland and three offshore islands in the Pacific has recently been completed by the United States Naval Air Missile Test Center at Point Mugu, California.

Standard assemblies of commercial-type FM radio and frequency-division multiplexing equipment have been used to obtain adequate communications facilities for close coordination of activities at the four separated locations. A map of the area covered by this radio installation is shown in Figure 1.

Point Mugu, situated on the Southern California coast approximately midway between Santa Barbara and Santa Monica, is ideally located for its role as a guided missile test and research base. Large areas of open ocean required for the tests are readily available, and a string of islands at varying distances from the coast provide excellent sites for control and check points. As shown in Figure 1, three of these islands are placed in continuous communication with the mainland by this radio installation.

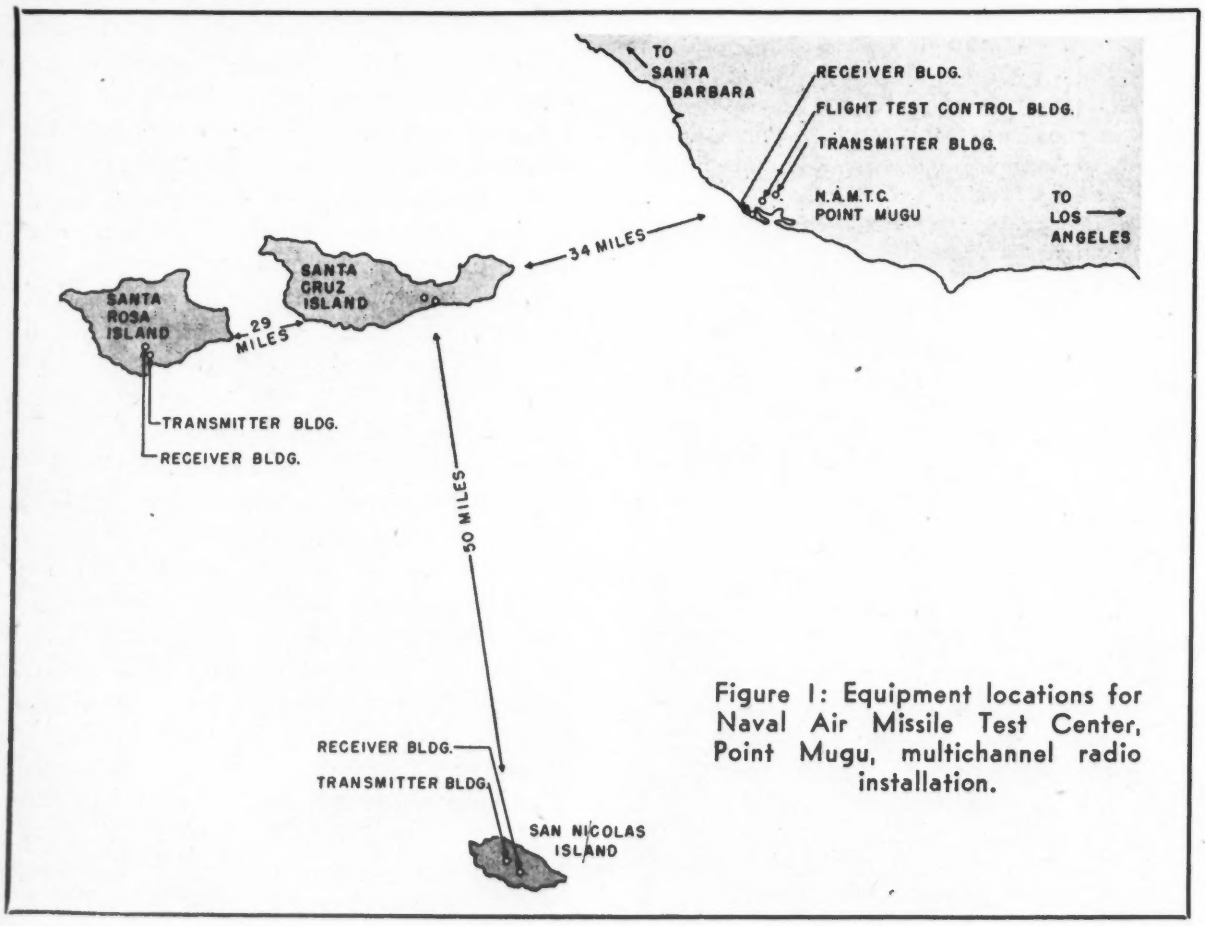


Figure 1: Equipment locations for Naval Air Missile Test Center, Point Mugu, multichannel radio installation.

Before this new installation was made, communication between the four stations was accomplished with UHF radio links multiplexed with four-channel carrier equipment. To obtain the additional circuits required with the same type of equipment as previously used would have required the use of at least six new radio systems, or the installation of submarine cables. The distances involved would make submarine cables prohibitively expensive, and the use of multiple radio systems would be both expensive and wasteful of frequencies.

Therefore, the Communications Engineers of the Range Instrumentation Department Facilities Division at Point Mugu decided to install radio equipment with sufficient bandwidth for more than 24 four-kilocycle voice channels. Frequency division equipment was chosen because it was felt that the performance record of this type of multiplexing is superior to that of other methods, and because the operational techniques are more orthodox and easier for operating personnel to learn.

Circuits

Twenty-three voice channels, each with its own signaling facility, plus five independent channels for telegraph signal transmission are provided by the new installation. These

nt Mugu

Captain E. M. Condra, Jr., commander of the Center, made the first phone call that put Point Mugu's inter-island communication system into operation in January. Behind Capt. Condra are the transmitters used in linking Point Mugu with its outlying islands. Others in the picture, all personnel at the Center, are (l to r) Frank Wheeler, W. C. Christensen, Keith Williams, R. F. White (co-author), Raymond Swigert, and L. W. Brown.

supplement and partially replace those previously installed. The telegraph channels are used for transmission of 60-wpm Teletype impulses. Each of the voice and telegraph channels is on a full party line basis, so each circuit can be used at the mainland or at any of the three islands and received simultaneously at the other three points.

To provide this full party line arrangement, the installation has been arranged with the Santa Cruz Island station serving as a hub for the other three. Information originating at Santa Cruz Island is relayed to the other three stations simultaneously, while information originating at the other stations is received at Santa Cruz Island and simultaneously relayed to the other two stations.

All three of the radio paths are almost entirely over water with path lengths of 34 miles between the mainland and Santa Cruz Island, 50 miles between Santa Cruz and San Nicolas Islands, and 29 miles between Santa Cruz and Santa Rosa Islands.

Equipment

Full interchange of information between the four stations of the system is obtained at Santa Cruz Island through a four-way, four-wire resistance bridge to which are connected all of the radio receivers and transmitters. This bridge provides four pairs of input terminals and four pairs of output terminals to which the radio and carrier inputs and outputs are connected. The resistance configuration is such that low loss is obtained between each input and three of the outputs, while a high loss is provided between the same input and one of the outputs. Thus, signals received from one station are passed through the resistance bridge to the transmitters sending to the other three stations, but are blocked from the transmitter sending signals back to the originating station.

Connections of the four-way, four-wire resistance bridge to other equipment are indicated in Figure 2, a block diagram of the Santa Cruz Island installation. One input and one output of the bridge are connected to the multiplex equipment providing local speech and telegraph circuits. The other three inputs are connected to the three receivers, and the other three outputs connect to the three transmitters located at Santa Cruz Island for communication with the mainland and the other two islands.

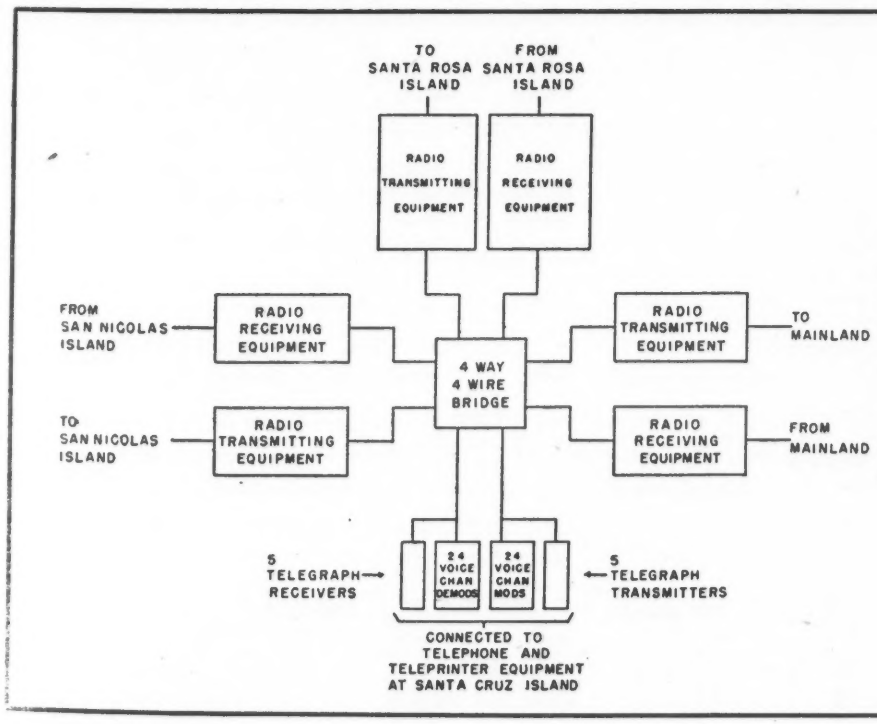


Figure 2: Santa Cruz Island forms a hub for the entire system. All information from any of the four stations is relayed to all other stations by equipment installed on this island.

As shown in Figure 2, the system is equipped with standby radio transmitters to assure no interruptions due to equipment failure. Duplicate receivers are also used for each individual radio path, but only one is connected to the circuit at a given time. A "CODAN" (carrier-operated-device-anti-noise) switching circuit is used. If the carrier fails or if its strength drops below a certain predetermined level, the codan relay in the receiver opens and switches the circuit over to the other receiver. No

diversity is involved and there is no comparison of signals.

All radio and multiplexing equipment used in the installation was manufactured by the Lenkurt Electric Co., San Carlos, Calif., and by Radio Engineering Laboratories, Long Island City, New York. A total of 12 radio transmitters and 12 radio receivers are installed, and a total of 96 channel terminals of Type 42 Carrier Telephone Equipment, and 20 channel terminals of Type 24 Carrier Telegraph Equipment are used. In addition, various equipment for monitoring and control is provided to assure instantaneous transfer to stand by radio equipment in case of failure of an operating unit.

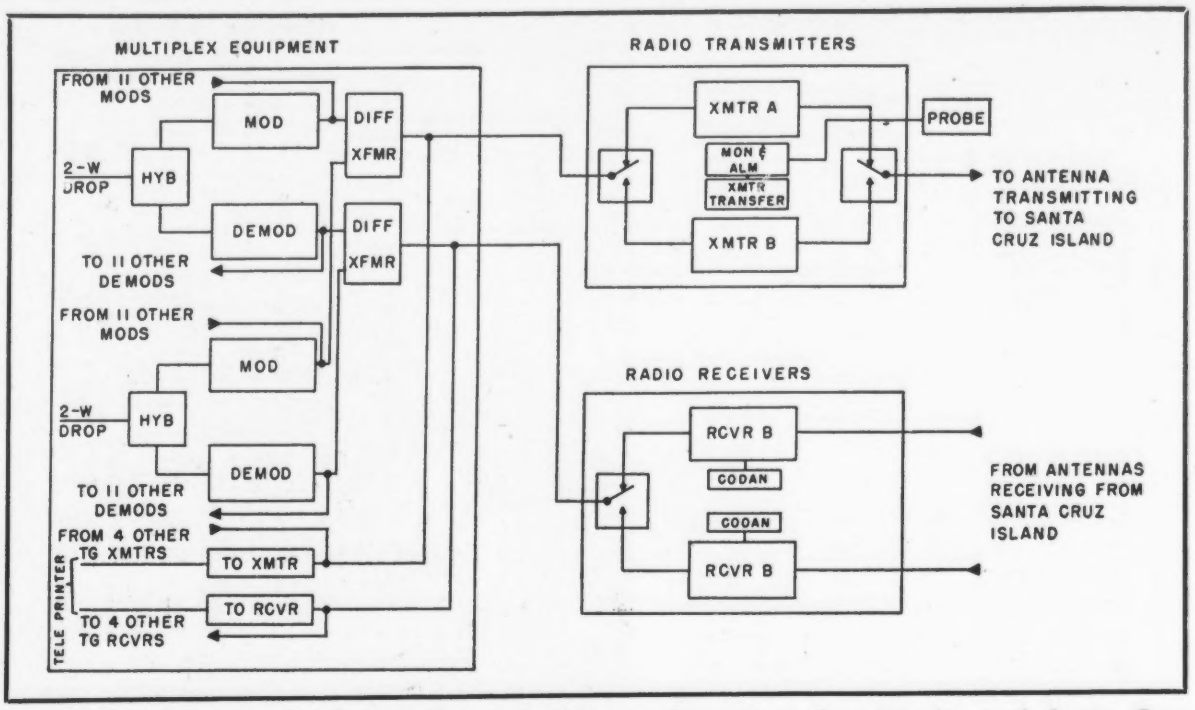


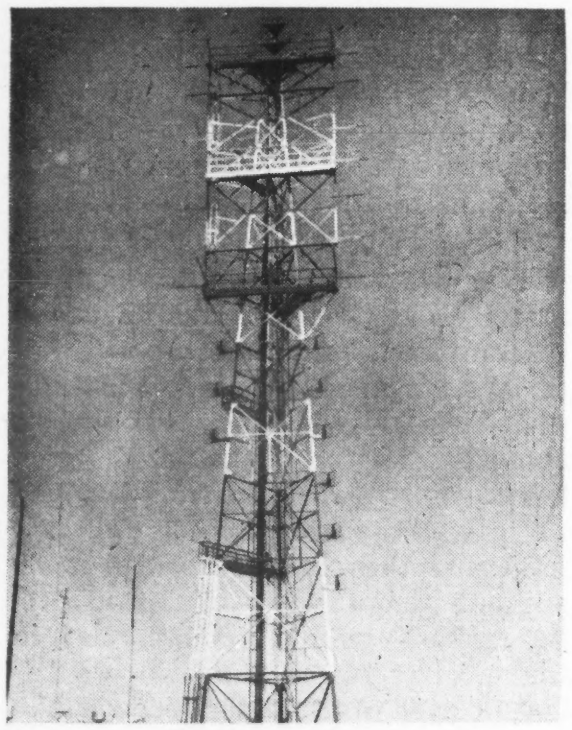
Figure 3: Arrangement of multiplex and radio equipment at San Nicolas and Santa Cruz Islands and at the mainland station.

Equipment Arrangements

Radio and multiplexing equipment installations at San Nicolas, Santa Rosa and Point Mugu are very similar and are laid out essentially as shown in the station block diagram of Figure 3. The multiplex equipment, shown to the left in the diagram, includes terminal equipment for 24 voice channels and 5 telegraph channels. Twenty-three of the voice channels are used for speech transmission, with the twenty-fourth subdivided into narrower channels for transmitting signaling impulses for the other 23. The outputs of two separate 12 channel groups are combined, with one occupying the carrier frequency spectrum from 12 to 60-kc, and the other occupying the spectrum from 60 to 108-kc. The five teletype channels which occupy frequencies below 12-kc are combined with the voice carrier output, and the combined frequencies modulate the transmitter.

Equipment for automatically switching between transmitters is also provided to connect the combined carrier frequencies to the proper transmitter input, and to connect the output of that transmitter to the antenna. The automatic transfer system for the transmitters consists of an r-f probe, monitor and alarm equipment, and a relay panel which sends impulses to the transmitters and to the other equipment panels to effect equipment transfer.

Figure 4: Exterior view of the mainland transmitter site at Point Mugu. Antennas for the new installation are mounted on the lower part of the antenna tower.



Terminals

Since excellent sites had previously been selected for the older low-capacity system which this new installation supplements, and since permanent buildings had been constructed for the older system, the locations for both radio and carrier equipment were determined by the existing building locations. No new construction was required other than slight changes called for to accommodate necessary equipment racks and interrack cabling.

On Santa Cruz and Santa Rosa Islands the carrier terminals are located almost adjacent to the radio equipment so the cable connections are kept short. At Point Mugu on the mainland the carrier terminals are slightly over 2 miles removed from the radio equipment, and on San Nicolas Island the transmitter and carrier terminals are adjacent, but the radio receivers are about 1½ miles away.

Since the carrier frequencies are all below 108-kc, they are transmitted between the carrier and radio sites at Point Mugu and San Nicolas over available cable facilities. Some equalization is necessary to compensate for the increasing attenuation at higher frequencies. Equalizing networks are used in the transmitting and receiving circuits at Point Mugu, as well as in the receiving circuit at San Nicolas Island. Other cable circuits are so short that equalization is not required.

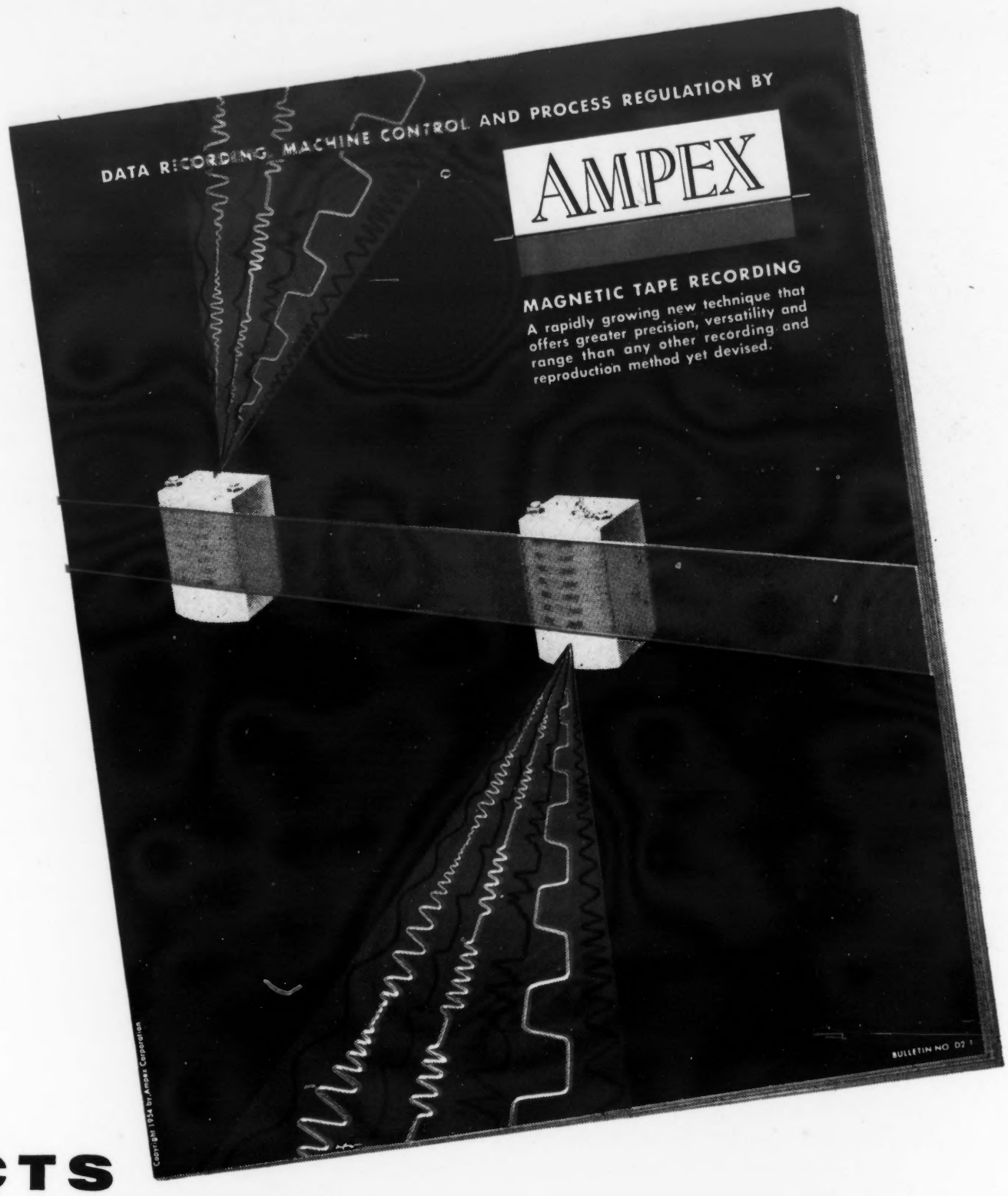
In all cases the radio equipment is located as near as possible to its antenna to keep the losses in connecting cables low. Both buildings and towers are used for antenna mounting, depending on the individual station facilities requirements. A typical equipment building and tower mounted antenna installation is shown in Figure 4. The dipoles in open reflectors on the bottom portion of the tower are used for this installation.

Installation

Since existing buildings were used in all instances, no major installation problems were encountered. Design work and selection of equipment were accomplished by Mr. W. C. Christensen and Mr. R. F. White under the direction of Mr. B. E. Harris and Mr. E. F. Knott, all of the staff of NAMTC at Point Mugu. Actual installation was made by an independent contractor, the Hallamore Manufacturing Company of Long Beach, California, with the work accomplished under the direction of Mr. H. G. Huff and Mr. Fred Smith.

Final system lineup and tests were performed by the NAMTC staff, assisted by personnel of the Lenkurt Electric Company.

It is expected that the additional communications facilities provided by this installation will be of considerable help in operation of NAMTC. With ample communications established on a permanent basis, it will be feasible for personnel at any one of the four stations to control each circuit and establish either individual or conference conversations with any other telephone in the base.



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From the President

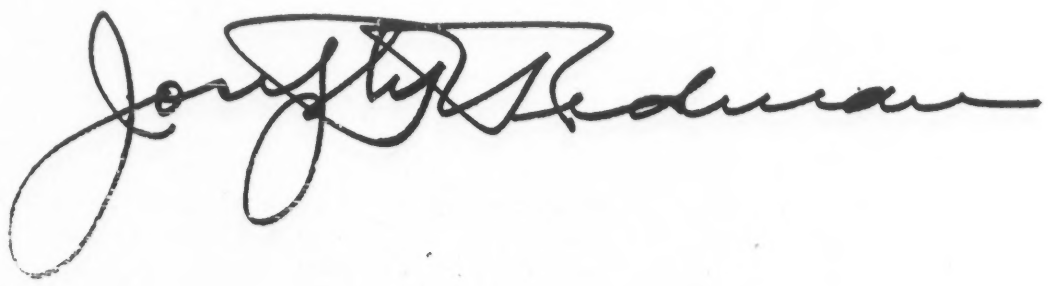
Because SIGNAL went to press before our 8th Annual Convention, and the election of new officers, we have this chance to hear once more from our outgoing president, Joe Redman. His message reiterates the appeal he has made many times before—active participation in Civil Defense.

During this last year, emphasis has been given to the need of the chapters to liaison themselves with their local Civil Defense Agency. The theme of the National Convention symposium was Civil Defense. I am sure all those attending came away with a clearer picture of the enormity of the problems confronting each and every community. Our challenge is how, as a nation, can we live up to our individual responsibilities involved in Civil Defense.

When my last message as President appears in this issue of SIGNAL, the Eighth Annual Convention of the AFCA will be history. That is not all the history that has been made this year. The H-Bomb, I truly feel, has shocked the nation into some realization of the catastrophic potentialities of such a weapon. Too long this nation has slumbered in the security of geographical isolation. Today that is a thing of the past—danger lurks at every door step.

Every phase of Civil Defense must depend upon electronic functions and communication facilities in carrying out its operations. The members of the Armed Forces Communications Association are, on the whole, those with considerable knowledge in the field of electronics. We owe it to our nation to make available this technical information and skill to both local and national agencies and to assist them in every possible way. The AFCA has a challenge, but, more precisely, a very real mission. It must accept this mission, and through it gain in size and strength.

It has been a pleasure to serve as your president this past year. You now have a new president, and your continued interest and support will be of great assistance to him in enlarging the scope of this organization and in increasing the aid we give our communities and our nation in the work of national security.



Association Affairs

GEORGE W. BAILEY BECOMES 7th AFCA NATIONAL PRESIDENT

On the cover of this issue, we present the new president of the Armed Forces Communications Association, George W. Bailey. Mr. Bailey, who was unanimously elected by the National Directors at the 8th Annual AFCA Convention, is the Executive Secretary of the Institute of Radio Engineers, a position he has held since 1945.

A graduate of Harvard College, Mr. Bailey is well known in the radio field through his long association with the American Radio Relay League of which he was president from 1940 to 1952. During that period, he was also president of the International Amateur Radio Union.

During World War II, Mr. Bailey served as Chief of the Scientific Personnel Office of the Office of Scientific Research and Development under Dr. Vannevar Bush, director, for which he received the President's Certificate of Merit.

Mr. Bailey has been a director and chairman of various committees of the AFCA New York Chapter since its chartering in 1946 and has served on the National Executive Committee of the AFCA since 1951.

THE ANNUAL CONVENTION

Record attendance and interest made the 8th Annual Convention, held in Washington May 6, 7 and 8, the most sucessful national meeting ever sponsored by the AFCA. Because the Convention is in progress as we go to press, a full report will not be available until the July-August issue.

Some highlights of the two day meeting include the Continental Defense Symposium with talks by the Honorable Val Peterson, Federal Civil Defense Administrator; the Honorable Arthur S. Flemming, Director, Office of Defense Mobilization; Maj. Gen. Frederick H. Smith, Vice Commander of the Air Defense Command, USAF; and Mr. Frederick R. Lack, Vice President of Western Electric. At the Annual Banquet, Mr. Hal S. Sumas, Executive Vice President of the American Telephone and Telegraph Co. delivered the main talk on "Communications for Continental Defense."

Colonel Atwood Returns to Civilian Industry

Colonel John W. Atwood, director of the Signal School's Enlisted Department at Fort Monmouth for the past two years, has left active service for a top position in civilian industry.

Colonel Atwood is returning to the Hoffman Radio Corporation in Los Angeles as Production Manager for the West Coast firm. Before his present assignment at the Signal Corps Center of the Army, he was Assistant Production Manager with the Hoffman firm for five years.

DR. ASTIN BECOMES HONORARY MEMBER OF AFCA

Dr. Allen V. Astin, Director of the National Bureau of Standards, has been made an honorary member of the Armed Forces Communications Association.

This membership in the Association was presented to him by Colonel George P. Dixon, Executive Vice President, at the March meeting of the New York Chapter. Dr. Astin was the guest speaker at that meeting (see Chapter News section).

Dr. Astin, who received his doctorate degree from New York University, joined the National Bureau of Standards in 1930. From 1944 to 1948 he was Assistant Chief of the Ordnance Development Division, and from 1948 to 1950 he was Chief of the Electronics and Ordnance Division.

From 1951 to 1952 he served as Associate Director and in 1952 was named to his present position as Director of the Bureau.

Dr. Astin is a member of the Institute of Radio Engineers, Sigma Xi, the American Association for the Advancement of Science, and has been cited by the President of the United States and the British Government for outstanding service.

Dr. Allen V. Astin (l), Director of the National Bureau of Standards receives certificate of honorary AFCA membership from Col. George P. Dixon, Executive Vice President.

Col. Fred W. Kunesh (r), Commanding Officer of Lexington Signal Depot receives his Kentucky Colonelcy from James Molloy, Fayette County Chairman of the March of Dimes Drive.

TWO SIGNAL DEPOTS CITED FOR AID IN MARCH OF DIMES DRIVE

Two Signal Depots have been cited for their assistance to the March of Dimes for the National Foundation for Infantile Paralysis.

Lt. Col. Edwin G. Fritz of the Decatur Signal Depot accepted a Commendation Scroll for outstanding assistance to the 1954 March of Dimes. Colonel Fritz, in accepting the Scroll, expressed his thanks and said that the goal would not have been achieved had it not been for the sincere and conscientious efforts of all Depot employees.

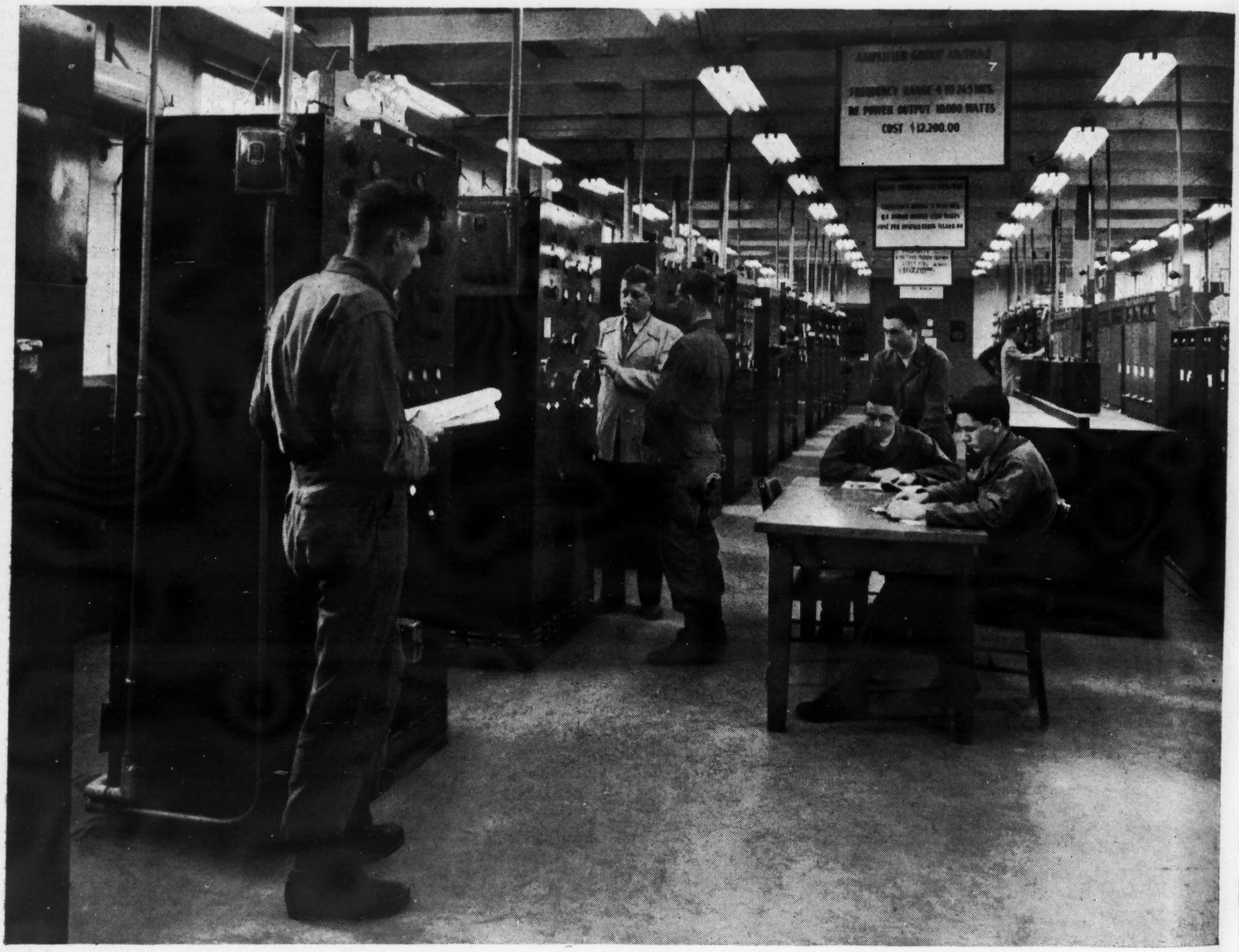
The Lexington Signal Depot has also been honored for their work in the March of Dimes drive.

Colonel Fred W. Kunesh, Commanding Officer of the Lexington Signal Depot, and President of the Kentucky Chapter of the AFCA, has recently been commissioned a Kentucky Colonel by Governor Lawrence W. Wetherby of Kentucky.

The presentation of the commission was made by the Fayette County chairman of the National Foundation for Infantile Paralysis in appreciation of the assistance which Colonel Kunesh and the Lexington Signal Depot gave to the March of Dimes.

Besides contributing money, depot technicians contributed their skill and time to the drive, and in receiving his Kentucky Colonelcy, Colonel Kunesh said, "I feel that I am being honored for the efforts of others."

Fort Monmouth students on "work horse" of the



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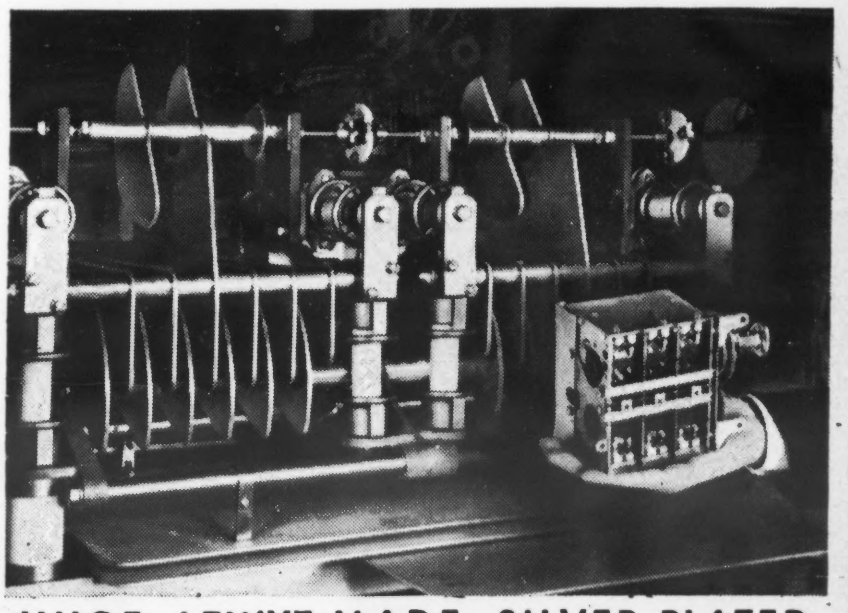

HUGE LEWYT-MADE SILVER-PLATED CONDENSER for the Power Amplifier measures 30" x 10" x 10". Each plate is 3/16" thick. Shown alongside it is a smaller Lewyt-built condenser, giving some idea of the range of Lewyt manufacturing capability.

AFCA Group Members

Communications—Electronics—Photography

Listed below are the firms who are group members of the Armed Forces Communications Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

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KANSAS CITY: President—Robert E. Conrath, AT&T Co., 324 E. 11th St., Kansas City, Mo. Secretary—R. R. Williams, AT&T Co., 324 E. 11th St., Kansas City, Mo.

KENTUCKY: President—Col. Fred W. Kunesh, Lexington Signal Depot, Lexington, Ky.

LONDON: President — Cornelius G. Mayer, 55 Pall Mall, London S.W. 1. Secretary—Maj. George E. Marak, Office of Air Attache, FPO 100, Box 36, N. Y.

LOUISIANA: President—C. C. Walther, 714 Howard Ave., New Orleans, La. Secretary—A. Bruce Hay, Southern Bell Tel & Tel Co., 520 Baronne St., New Orleans, La.

NEW YORK: President—Vice Adm. W. S. Anderson, Automatic Electric Co., 21 E. 40th St., New York, N. Y. Secretary—David Talley, Fed. Tel. & Radio Corp., 100 Kingsland Rd., Clifton, N. J.

NORTH TEXAS: President—Thomas E. Manning, 6517 Bandera Ave., Dallas, Tex. Secretary—Perry A. Norman, 5422 Miller Ave., Dallas.

PARIS: President—Arian H. de Goede, 79 Avenue des Champs Elysees, Paris 8, France. Secretary—Lt. Col. Andrew J. Burch, SigDiv, SHAPE, APO 55, N. Y.

PHILADELPHIA: President—Victor K. Cohen, Victor-Bernard Industries, 1511 N. 26th St., Philadelphia, Pa. Secretary—Lt. Col. Robert W. Pearson, RCA Victor Div., Bldg. 15-7, Camden, N. J.

PITTSBURGH: President — S. E. Phillips, Bell Tel. Co. of Pa., 416 7th Ave., Pittsburgh, Pa. Secretary—H. W. Shepard, Jr., 386 Arden Road, Pgh.

RIO: President—Herbert H. Schenck, Caixa Postal 709, Rio de Janeiro, Brazil. Secretary—Col. John E. Kelsey, Joint Brazil-U.S. Mil. Comm., APO 676, N. R.

ROCHESTER: Inactive.

SACRAMENTO: President—Brig. Gen. Clarence P. Talbot, McClellan AFB, Calif. Secretary—C. A. House, Sacramento Signal Depot, Sacramento, Calif.

SAN FRANCISCO: President — Col. Lloyd C. Parsons, 1807 - 16th Ave., San Francisco, Calif. Secretary — William R. Patton, 965 Chestnut St., San Carlos, Calif.

SAN JUAN: President—Capt. A. M. Patterson, U. S. Naval Communication Station, San Juan, Puerto Rico. Secretary—Lt. F. Ramirez-Rodriguez, U.S. NAVCOMMSTA, San Juan.

SCOTT-ST. LOUIS: President — Col. Gomer Lewis, DCS/O, Hq. ATRC, Scott AFB, Ill. Secretary—Allan L. Eisenmayer, PO Box 456, Trenton, Ill.

SEATTLE: President — Warren J. Taylor, 3944 W. Rose St., Seattle, Wash. Secretary—Merrill R. Stiles, 916 W. 122nd, Seattle.

SOUTH CAROLINA: President—Walter G. Edwards, Southern Bell T&T Co., Owen Bldg., Columbia, S. C. Secretary—William R. Carter, Southern Bell T&T Co., 805 Owen Bldg., Columbia, S. C.

SOUTHERN CALIFORNIA: Acting President—Randolph C. Walker, 2265 Westwood Blvd., Los Angeles 64, Calif. Secretary—Lester R. Daniels, 2265 Westwood Blvd., Los Angeles 64, Calif.

SOUTHERN CONNECTICUT: President—Edgar L. Love, 175 Dessa Drive, Hamden, Conn. Secretary—James J. McKeon, Sound Scriber Corp., 146 Munson St., New Haven, Conn.

SOUTH TEXAS: President — Col. George L. Richon, SigSec, Hq. Fourth Army, Fort Sam Houston, Tex. Secretary—Grover A. Krone, 2100 N. New Braunfels Ave., San Antonio 8, Texas.

TINKER-OKLAHOMA CITY: President—Brig. Gen. Thomas L. Bryan, Jr., 1800th AACS Wing, Midwest City, Okla. Secretary — Alfred L. Woods, 308 Kerr Drive, Midwest City, Okla.

WASHINGTON: President—Thomas B. Jacocks, General Electric Co., 777 14th St., N.W., Washington, D. C. Secretary—D. A. Wilkinson, General Electric Co., 777 - 14th St., N.W., Washington, D. C.

ACTIVE STUDENT CHAPTERS

IOWA STATE COLLEGE, Ames, Ia. President—Ralph S. Millhone. Secretary—Michael J. Kasperbauer.

NEW YORK UNIVERSITY, New York, N. Y. President—Cecil R. Frost. Secretary—Edward Abelowitz.

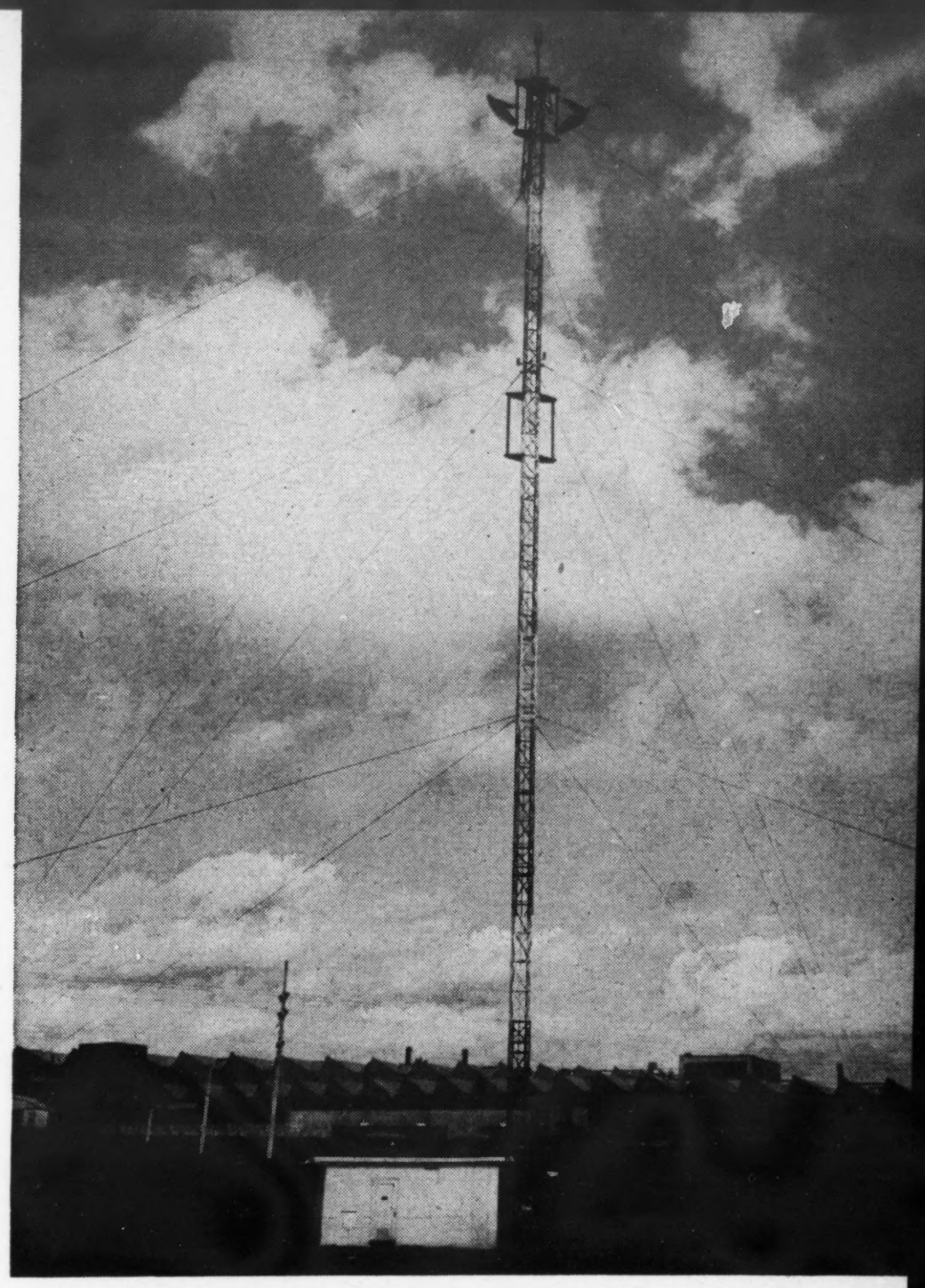
NORTHEASTERN UNIVERSITY, Boston, Mass. President—Fred Hersey. Secretary—Curtis N. Tholander.

NORWICH UNIVERSITY, Northfield, Vt. President—David Luce. Secretary—William Altman.

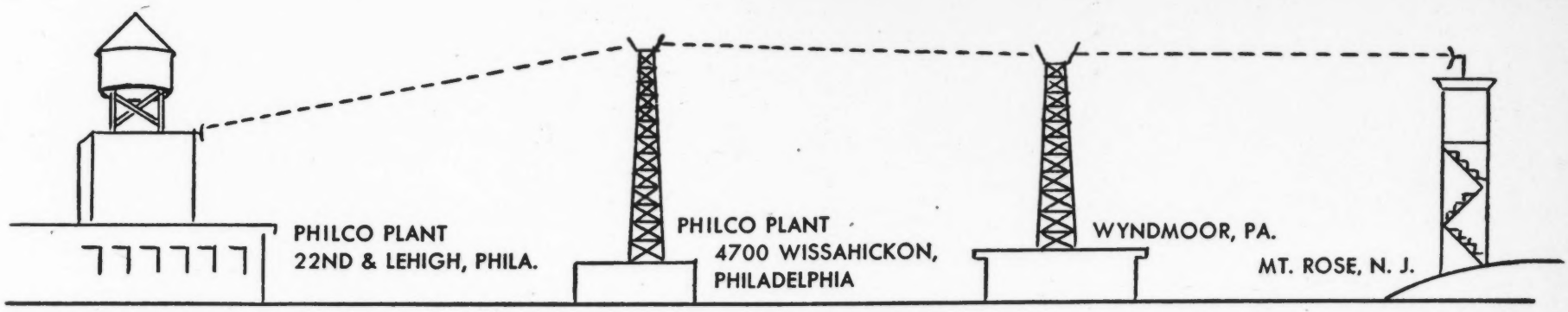
UNIVERSITY OF VIRGINIA: Charlottesville, Va. President—Carl B. Caplinger. Secretary — L. Myron Diamondstein.

National Headquarters Chapters Secretary: Julia B. Godfrey

PHILCO "PROVING GROUND" FOR MICROWAVE



Philco 160-foot microwave tower at 4700 Wissahickon . . . one of four similar Philco test sites in the Philadelphia area.



To supply industry's mounting demand for modern, efficient and private communications which do not depend on vulnerable wire lines, Philco is installing thousands of miles of new microwave for oil and gas pipelines, utilities, railroads and other major industries. Constantly improving the performance and reliability of Philco microwave equipment, each newly designed component and equipment is field tested and perfected on Philco's experimental microwave system . . . the equivalent of a 70-mile commercial installation . . . Another reason why Philco Microwave leads the field in quality, performance and reliability . . . Good reason why Philco is the world's leading manufacturer of microwave equipment.

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Chapter News

Atlanta

Maj. General George I. Back, Chief Signal Officer of the Army, was guest speaker at the chapter's March 2nd meeting and was honored by a record attendance of some 270 members and guests.

With "The New Look in Communications and Electronics for the United States Army" as his topic, General Back pointed out that despite guided missiles and nuclear energy, ground forces continue to play a major role. But "in the face of the awesome destructiveness of modern weapons, the ground commander must base his tactics on great mobility and wide dispersion; he must rely on electronic means of transmitting intelligence and commands with even greater speed, greater security, and greater reliability than has heretofore been attained." The general went on to say that the new demands of surveillance of the battlefield, reduced vulnerability to interference. and simplicity of operation and maintenance coupled with standards never before attained in reliability, security and speed, must be met with due regard for the economy of resources in funds, manpower and production facilities.

Describing the Army Electronic Proving Ground established at Fort Huachuca, Arizona, early in the year, General Back said, "We plan for this proving ground to be the crucible into which we pour our operational problems, and through the application of experimental methods under simulated conditions of warfare, we expect to crystalize procedures, organizations and systems fulfilling the demands of the new look."

Also featured on the program was Fred J. Turner, president of the Southern Bell Telephone and Telegraph Company. Mr. Turner praised the chapter for its accomplishments and cited the cooperation of his company in AFCA endeavors.

The Chief Signal Officer was guest speaker at the Atlanta Chapter's March 1st meeting. Prior to the banquet, Fred J. Turner, president of Southern Bell Telephone and Telegraph Co., explained how the Civil Defense air raid warning system works. Looking on are (left) Lt. Gen. A. R. Bolling, Third Army Commanding General, and General Back.

In lieu of certificates of accomplishment awarded for completion of the course of training observation of the Southeastern Signal School which they completed earlier in the day. General Back was also presented a copy of the Signal Corps annual, "Siganna."

Chapter President W. O. McDowell expressed the chapter's pleasure at having the Chief Signal Officer as its guest. After a short informal talk by General Back, the meeting was turned over to the Third Army entertainers for an excellent program.

The chapter's March 25th meeting featured a talk on the rapid expansion in telephone service in Southern states since 1940 by W. Kelly Mosley, Georgia manager of the Southern Bell Telephone and Telegraph Co. and president of the Atlanta Chapter of the AFCA. Mr. Lane Hubbard, vice president of Southern Bell was a special guest of the chapter.

Augusta-Camp Gordon

The Augusta-Camp Gordon Chapter was host to General Back on March 4th at a social hour and dinner at the Camp Gordon Officers' Open Mess.

Brig. General T. J. Tully, honorary president of the chapter, presented General Back and Colonel A. R. Morley, Signal Officer, Third Army, to the members and guests. He then called on Colonel H. A. Buck, commanding officer of the Southeastern Signal School, who presented General Back and Colonel Morley with mortar boards

Baltimore

The program for the chapter's February 16th meeting, held at Friendship International Airport, was a joint presentation by the Friez Instrument Division of the Bendix Aviation Corporation, the United States Weather Bureau and the Civil Aeronautics Administration. Two hundred members and guests were present.

Following a buffet dinner, introductory talks concerning the activities to follow were given by L. D. Kiley, general manager, Friez Instrument Division; Capt. H. T. Orville, USN (Ret.), technical consultant, Friez Instrument Division; George N. Brancato, officer-in charge, U. S. Weather Bureau, Friendship Airport; and F. A. Kain, officer-in-charge, CAA, Friendship Airport.

The Friez Instrument Division featured an exhibit of standard meteorological equipment including Radiosondes, temperature and humidity measuring equipment and Lobby Display instruments. An interesting movie pertinent to weather and communications was also shown.

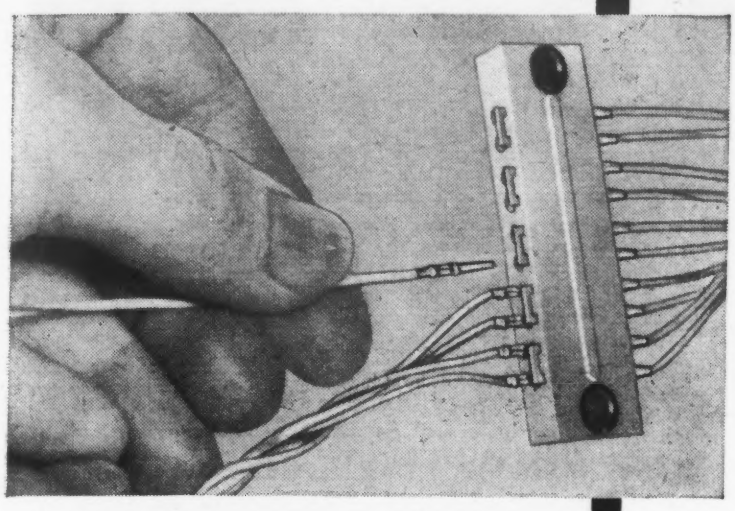
A tour of the CAA and Weather Bureau facilities was conducted with guides from the Bendix-Friez Engineering Department and representatives from the CAA and the Weather Bureau. Representatives from Bendix-Radio were on hand to explain their new Airport Surveillance Radar ASR-3 equipment which permits the tower operator to visually observe the range and azimuth of all aircraft within fifty miles of the tower.

The Baltimore Signal Depot was host to 160 Baltimore Chapter members and guests at its Maintenance Division on March 2nd. An excellent program was arranged by Col. A. H. Anderson, commanding officer of the depot, which included tours of the crystal shop and the radar shop and demonstrations of their maintenance equipment. Colonel Anderson welcomed the chapter and outlined the many activities of the Baltimore Signal Depot. The tour was conducted by Major George Brooks of the Depot.

Col. George P. Dixon, AFCA Executive Vice President, reported on association affairs and commended the chapter for its excellent turnout. Victor Cohen, president of the Philadelphia Chapter, was a special guest.

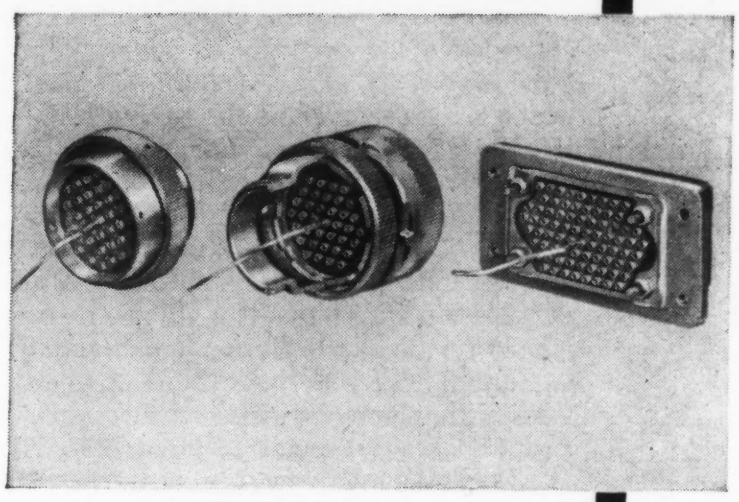
Boston

Featured speaker at the chapter's March 18th meeting was J. Ernest



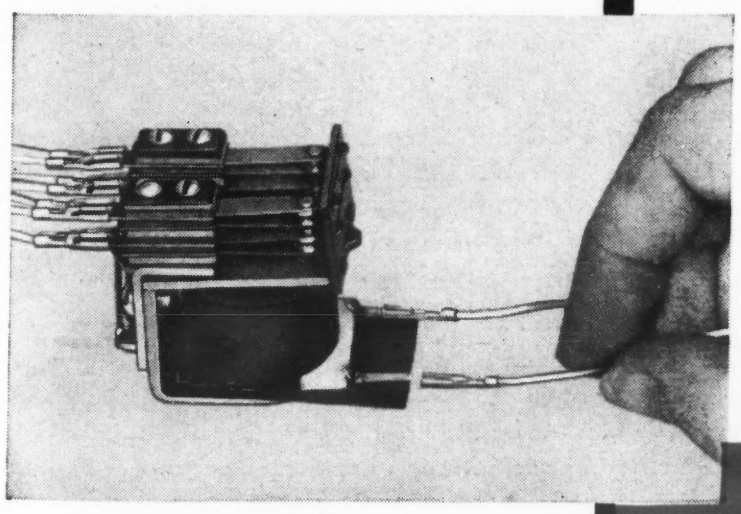
BASIC 10 CONNECTOR TAPER-BLOK WITH DUAL CONTACTS

Photo shows TAPER-BLOK with A-MP TAPER PINS in place. Strip measures only .610" x 2". Blocks, made of NYLON 10001, can also be stacked to accommodate hundreds of circuits.



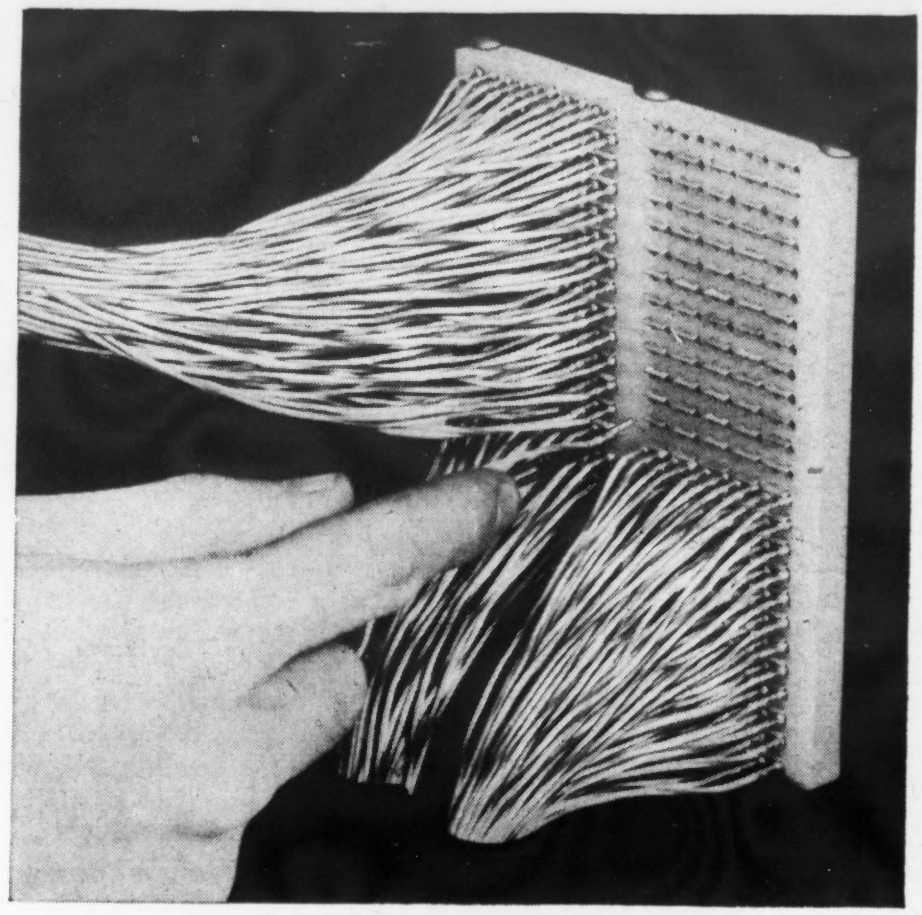
TAPER PINS FOR MULTIPLE CONNECTORS, AN AND OTHER TYPES

Amphenol, Cannon, Continental and Winchester Connectors now are available with tapered receptacles for A-MP self-locking TAPER PINS. Saves over 80% of your wire assembly time and provides uniformly higher quality connections at lower cost.



TAPER TAB RECEPTACLE APPLICATIONS

More and more flat tabs on relays, switches and other components are being tapered to receive A-MP TAPER TAB RECEPTACLES. Fast easy assembly reduces costs and provides higher quality connections.



NEW A-MP MINIATURE TAPER-BLOK

For AMP Taper Pins

(Wire Ranges: #26 to #16)

NEW TAPER-BLOK FOR A-MP'S TAPER PINS HELPS YOU SAVE SPACE AND WEIGHT, SPEEDS UP WIRING ASSEMBLY, SIMPLIFIES DESIGN, AND REDUCES COST!

The TAPER-BLOK shown has receptacles for 1000 connections, yet measures only 4" x 5" x ⅝"! Receptacles are designed to receive A-MP self-locking Taper Pins which can be easily pushed in place with A-MP's CERTI-LOK measured energy insertion tool.

Extremely high contact pressure assures dependable, uniform, low resistance connections for electric and electronic circuits.

Assembled TAPER-BLOKS are available in 10 and 20 connector sizes with single or dual receptacles. TAPER-BLOK strips can be assembled by stacking to provide the number of connections required for your design. Write for specific information and latest prints.

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Head table at Augusta-Camp Gordon dinner in honor of General Back. Left to right: Mrs. W. A. Spier; Col. Harold A. Buck; Mrs. T. J. Tully; General Back; Brig. Gen. T. J. Tully, honorary chapter president; W. O. McDowell, chapter president; Mrs. Harold A. Buck; Col. W. A. Spier; and Mrs. W. O. McDowell.

Smith, assistant vice president of the Raytheon Manufacturing Company, a group member of the AFCA. Mr. Smith discussed recent innovations in communications as they applied to color television, amateur radio and astronomy.

The meeting took place at the Officers' Club of the U. S. Naval Receiving Station, South Boston, with 65 members and guests in attendance.

Cayuga

Another new name has been added to AFCA's list of chapters—the Cayuga Chapter, which will cover West Central New York State. The chapter was organized with the assistance of Brig. Gen. Tom C. Rives, USAF (Ret.), General Electric Company, Syracuse.

Headquarters of the chapter are at GE's Advanced Electronics Center, Cornell University, Ithaca. Temporary officers have been chosen as follows: president—J. R. Hafstrom; vice-presidents—R. L. Wooley and S. M. Kaplan; secretary—R. O. McCary; treasurer—M. E. Seymour. Plans are now being made for full-scale chapter activities.

Chicago

The Kellogg Switchboard and Supply Company was host to the chapter on March 31st. Featured speaker was Mr. H. L. Garrison, superintendent of ground communications, United Air Lines, who discussed "Communications Serves United Air Lines" and implemented his talk with several films.

Dayton-Wright

Byron Thornton, special field representative, sales training department, National Cash Register Company, addressed the February 23rd meeting at the Biltmore Hotel. With "The *How* of Creative Selling" as his subject, Mr. Thornton discussed in detail the course NCR gives their salesmen, covering such points as creative selling factors, basic selling principles, sales personality, selling plan, knowledge of product, etc.

Decatur

The new officers elected at the end of the year were installed at the chapter's January 28th meeting. In taking over the presidency, Colonel Frank J. Schaal, commanding officer of the Decatur Signal Depot, reviewed the aims and purposes of the association and pledged his support in carrying them out.

The evening's program was presented by Al Pigg, farm-news director of television station WTVP.

The chief engineer of WTVP, H. F. Abafelter, was guest speaker. He described the equipment and operations of the television station and invited the chapter to visit it in the near future.

At the conclusion of the business session, the chapter adjourned to the Illinois Bell Telephone Company Building for a guided tour of the facilities and a demonstration of the latest equipment.

Detroit

The February 25th chapter meeting consisted of an evening of movies. The films were: "War Comes to America" which was a resume of the events which led the United States into World War II; "Operation A-Bomb," the most recent movie in color of an A-Bomb explosion in the desert near Las Vegas and featuring the Marine Corps; and "Operation Blue-Jay," a film on the Air Force Base at Thule, Greenland.

Annual elections were held on April 7th, with the following result: president—Paul J. Schafer, Office of Civil Defense; vice-presidents—H. W. Thompson, Western Union; T. F. Wilt, Motorola; Major B. Adams, Selfridge AFB; secretary—J. R. Saxton, Michigan Bell Telephone Co.; assistant secretary—H. A. Dawson, Michigan Bell; treasurer—W. N. Montgomery, Michigan Bell; assistant treasurer—R. A. Berkfield, Michigan Bell.

The program feature was the Navy Department film, "Project Tinkertoy."

Fort Monmouth

Some 200 members and guests turned out for the February 19th meeting to hear Maj. Gen. Ernest N. Harmon USA (Ret.), president of Norwich University, speak on "Mobile Communications." General Harmon, who commanded the 1st and 2nd ("Hell on Wheels") Armored Divisions in World War II, pointed out the importance of communications by stating that "communications are the nerve-center of every command."

He described the actions of his divisions in the Battle of Mateur in North Africa and in the Battle of the Bulge in France and pointed out how communications played an all-important role in these battles. He said that communications were more fully developed in the French campaign than in earlier stages of the war. "We had five tanks in France that did nothing but communicate with airplanes," he stated,

Boston's March meeting was addressed by J. Ernest Smith, asst. vice president, Raytheon Manufacturing Co. L to R: David R. Hull, chapter vice-president; Mr. Smith; Raymond B. Meader, chapter president; and Mac Bougere, program chairman.

"and these tanks were on the forward fringe of the battle line from where they could call on air power as needed." "That way air (power) could 'sweeten it up' before we went in with tanks."

General Harmon played down the importance of secrecy on the front lines, saying that "I think the secrecy up front is greatly exaggerated . . . because the enemy wouldn't have time to do anything." He was referring to the use of code in communications, and radio silence. Since armored units are primarily mobile they rely for the most part on radio for communications. Showing the reliance of armor on radio, the general said that in his divisions he maintained schools for radio operators in rear areas and kept them going at all times—even during the nine battles that he took part in during World War II.

It was announced that Trad Television Corp. of Asbury Park had recently become a group member of the AFCA. Mr. A. Wm. Christopher, Jr., assistant vice president, and several other representatives of the corporation were introduced and welcomed into the chapter.

During its spring membership drive, the chapter boosted its total strength to well over 700, it was announced at the March 18th meeting. Chapter President Paul Langguth congratulated Col. Norman L. Tittle, chairman of the membership committee, on this achievement which gave the chapter its largest membership in eight years of existence.

Evidence of the record-breaking membership was the record-breaking attendance of 450 persons who attended the dinner and then heard Dr. J. B. Rhine, director of the Duke University parapsychology laboratory, describe the mysterious field of extra-sensory perception which covers the phenomena of telepathy, clairvoyance and recognition.

AFCA Executive Vice President George Dixon was a guest at the meeting. He spoke briefly and stated that the 450 persons present comprised the largest attendance of any AFCA chapter meeting he had ever attended.

Dr. Rhine described extra-sensory perception as "perceiving without the use of recognized senses." Although the Duke professor could not pinpoint definite applications for his science, he said he takes it seriously "even though I don't know how its application will come out."

He posed one possible application as being a means of combating communism, which is based on the materialistic philosophy of Marxism. Dr. Rhine said that the answer may lie in something deeper than materialistic philosophy. He felt that this might be extra-sensory perception—which if it were developed further could possibly provide an insight into the minds of the Communists.

"The physical world as we know it has nothing to do with this (extra-sensory perception)," Dr. Rhine pointed out. "It doesn't relate to time and space as we know it." Since his science doesn't jibe with physical principles, he said that natural science is used as the basis for extra-sensory perception studies.

Bendix Friez program at Friendship International Airport featured Baltimore's February meeting. Above, H. L. Alkire explains how U. S. Weather Bureau observations and forecasts are made.

Gulf Coast

Major Don L. Poling, Director, Airborne Electronics Department, Keesler AFB, presented a review of the book, "The Mathematical Theory of Communication," by Shannon and Weaver, at the chapter's February meeting. The group showed considerable interest in the theory and a stimulating question and answer session was conducted at the conclusion of the talk.

It was announced at the March meeting that Lt. Col. Byron Gilmore, chapter president, had been transferred overseas and that Vice-President Thomas M. Ingling would act as president until the annual elections in May.

The following committee chairmen were appointed: publicity—Maj. John L. Wyatt; membership—OCED area—Capt. A. N. Lee; Gulfport area—James C. Dabney; TTAF area—Emmet Williams; program—Ancil V. Arseneaux.

A talk on micro-wave radio relay by Capt. George A. Winer of the Officers Communication-Electronics Department, Keesler AFB, was the program feature.

Mr. Oscar Evans, Jr., division transmission and protection engineer on the staff of the Mississippi chief engineer, Southern Bell Telephone and Telegraph Co., presented an informative talk on carrier in the Bell System at the chapter's April 5th dinner-meeting.

Johnson Air Base

A petition for charter for the Johnson Air Base Chapter, located in Tachikawa, Honshu, Japan, was received and approved at national headquarters early in March. The new unit was organized through the efforts of 1st Lt. Peter Tokareff, Jr., 528th AC&W Group.

Temporary officers of the chapter are: president—Maj. Ralph S. Beightol; vice-presidents—Maj. Hubert J. Barks and CWO William P. Branigan, Jr.; secretary—Lt. Tokareff; treasurer—John Y. Mastich.

Speakers at Dayton-Wright's recent meeting on "Impact of Electronics on Aviation." Left to right: Chapter President George B. Meyer; John E. Keto, Wright Air Development Center; T. H. McNary, Boeing Airplane Co.; and H. R. Oldfield, Jr., General Electric Co.

London

The American members of the chapter met on March 11th to set up the necessary procedures for efficient chapter operation. A working committee was appointed, consisting of representatives from the Army, Navy, Air Force, State Department and industry, with the preparation of a chapter constitution and by-laws as its immediate task.

A nominating committee consisting of Capt. Peter H. Horn, USN, chairman, George A. Ellsworth, American Embassy, and Romney Wheeler, NBC,

submitted the following slate of temporary officers which was elected: president—Cornelius G. Mayer, RCA; secretary—Maj. George E. Marak, Air Attache's Office; treasurer—George A. Ellsworth. The following British nationals were elected to associate officers: associate secretary—L. T. Hinton, commercial manager, Standard Telephone & Cables, Ltd; associate treasurer—P. A. Turner, managing director, RCA Photophone, Ltd.

The chapter held an informal gathering on March 25th to acquaint its British friends with the objectives of the association and to interest them in becoming associate members of the chapter. A schedule of chapter activities is now being planned which will be of interest both to the American members and the British associate members of the chapter.

Dr. J. B. Rhine, director of Duke University parapsychology laboratory, addressed Fort Monmouth's March meeting. L to r: AFCA Executive Vice President George Dixon; Dr. Rhine; and Chapter President Paul Langguth.

Louisiana

The U. S. Coast Guard Station on Lake Pontchartrain was host to the chapter for its March 9th meeting. The program, which consisted of a lecture-demonstration and a film depicting some of the services rendered by the Coast Guard in peace and war, was arranged by Lt. Cdr. H. I. Allen and CWO Mercer Reynolds.

Capt. Frank Leamy, Commander, 8th Coast Guard District, and several members of his staff were among those present.

New York

General Charles L. Bolte, USA, Vice Chief of Staff, delivered the principal address at the New York Chapter's February meeting. His subject was "The Role of the Army in National Defense".

"American ingenuity and skill also play a vital role in our national security", the general said. "They make a tremendous contribution to the striking power, the mobility, and the flexibility of our fighting forces. At the same time, we must never lose sight of the elemental fact that, in the last analysis, victory in war depends on human beings. . . . We must not fall into the error—potentially a fatal one—of thinking that in war we could replace manpower with machine power to the degree that we have done so in other fields of endeavor."

Stressing that "without communications there can be no exercise of command on the battlefield" and that "an army's mobility, in terms of effectiveness at least, is directly related to its communications capability", General Bolte went on to sketch the military adaptations of communications in the U. S. since the Civil War. He also pointed out that the establishment of the Army Electronic Proving Ground at Fort Huachuca extends the Army's capabilities for research in the vital field of development and testing of military communications equipment and techniques.

The dinner-meeting was held at the Belmont Plaza Hotel. Among the distinguished guests present were; Col. Paul O. Langguth, president of the Fort Monmouth Chapter; Maj. Gen. Kirke B. Lawton, Commanding General, Fort Monmouth; Rear Adm. C. L. Green, Deputy Commander, Eastern Sea Frontier and Atlantic Fleet; Maj. Gen. J. V. Murphy, Chief of Staff, First Army; Rear Adm. L. B. Olson, Commander, Eastern Area, Coast Guard; Rear Adm. R. Mason, Commander, Military Sea Transport Service, Atlantic Area; and Col. Orville Laird, representing the Commanding General of the Continental Air Command.

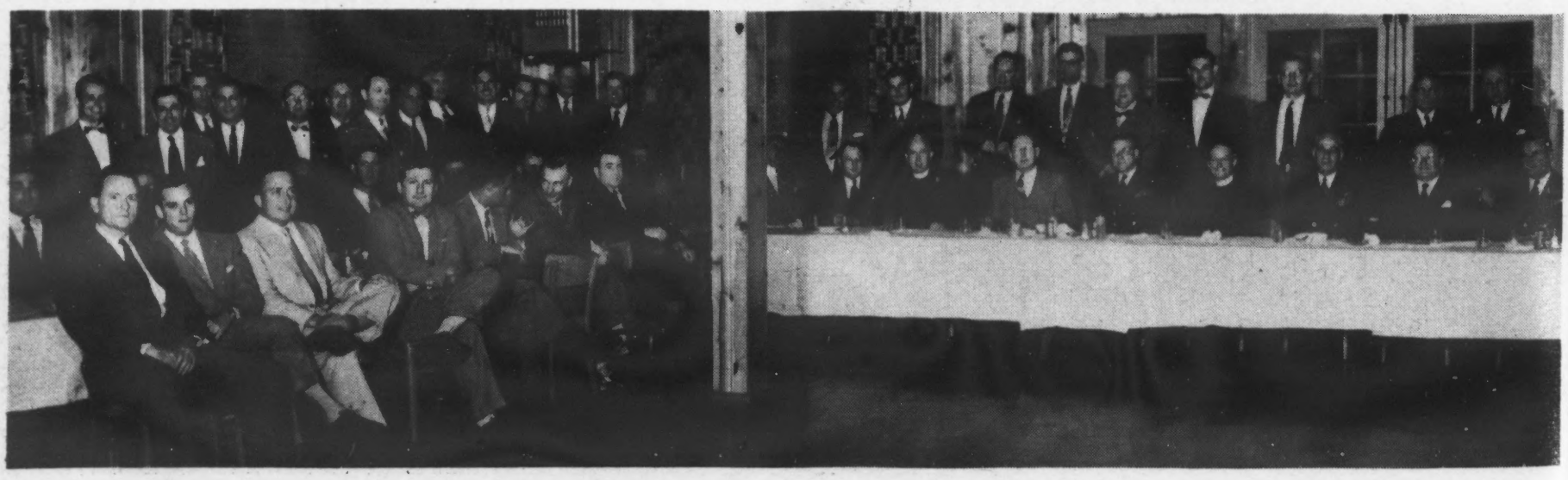
Dr. Allen V. Astin, Director of the National Bureau of Standards, was guest speaker at the March 31st meeting. Discussing "Electronics at the National Bureau of Standards", Dr. Astin described the activities of the electronics and research branches of the Bureau, particularly as they tie in with the military establishments. He also reviewed the history of the electronics and research activities of the Bureau from pre-World War I days to the present. Col. George Dixon, AFCA Executive Vice President, presented Dr. Astin an honorary AFCA membership (see Association Affairs section).

North Texas

At its organizational meeting on April 2nd at the Officers' Club of the Naval Air Station, Grand Prairie, the North Texas Chapter received its official charter and elected a slate of officers to head the chapter during its first year of activity.

The officers are: president—Thomas E. Manning, Western Union Telegraph Co.; vice-presidents—J. R. Coursey, Philco Corp., and T. F. Byrnes, American Telephone and Telegraph Co.; secretary-treasurer—Perry A. Norman, Western Union; directors—Col. T. F. Yates, SigC, USAR; Cdr. R. W. Aherne, USN, Dallas Naval Air Station; Col. J. M. Maersch, Carswell

Louisiana Chapter members shown at their dinner-meeting on March 9th at the U. S. Coast Guard Station on Lake Pontchartrain. The program highlighted the services rendered by the Coast Guard in peace and war.



Army Unveils Skysweeper...

Deadly Accurate Anti-Aircraft Gun

THE STORY BEHIND THE STORY:

■ "HOW CAN WE stop hostile jets that slip through our primary defenses?" Newsmen covering Army Ordnance's demonstration of the Skysweeper saw the answer to attack by high-speed aircraft at medium range—and spread the story over front pages from coast to coast. It was the story of a gun that could "see" through fog and darkness . . . pick out an enemy within a 15-mile radius . . . compute its speed, altitude and course in seconds . . . then, automatically aiming itself, shoot the plane out of the sky.

■ Actually the story began when Army Ordnance anticipated the threat of faster flying jets and started to work with Sperry on the problem. Through its pioneering in radar, Sperry engineers were able to design the "eyes" of needed performance. From Sperry's experience in electronics came the "brains" to compute precise firing information. Sperry's developments in servo mechanisms provided the "muscles" for rapid aiming and firing.

■ The Skysweeper gunfire control *system* which resulted from the cooperative efforts of Army Ordnance and Sperry is typical of the many systems which Sperry has developed working with various branches of the military to meet critical needs. Once developed, Sperry manufacturing specialists convert engineering designs into precision weapons for large scale production. Among similar projects at Sperry today are systems for bombing and navigation, missile guidance and naval gunfire control.

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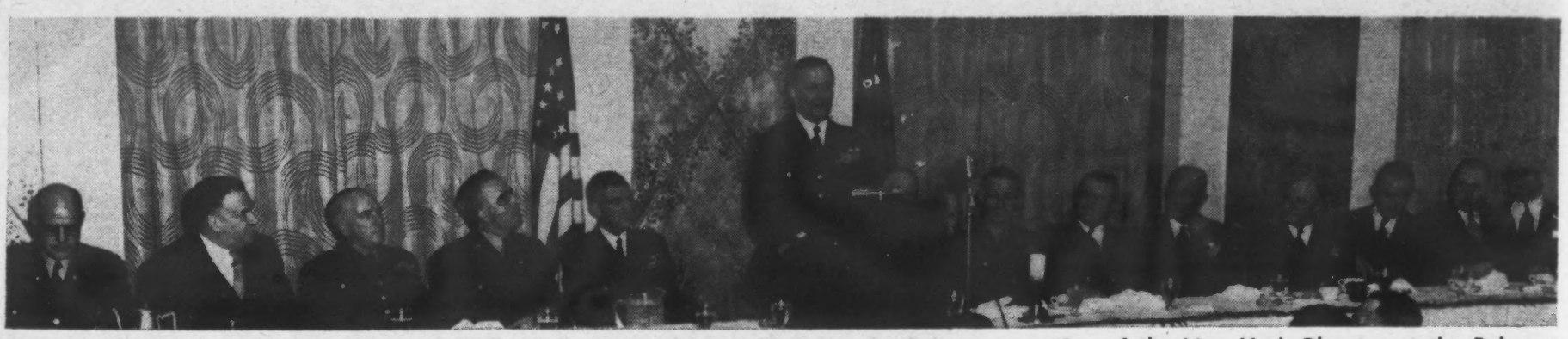


General Charles L. Bolte, Vice Chief of Staff, U. S. Army, shown addressing the February meeting of the New York Chapter at the Belmont Plaza Hotel. The subject of his talk was "The Role of the Army in National Defense."

AFB; H. L. Housley, Automatic Electric Co.; and E. L. Falls, Motorola, Inc.

A chapter constitution and by-laws were adopted and plans were set in motion for regular activities.

Paris

The second annual meeting of the Paris Chapter was held at Cercle Militaire on March 8th.

The feature address of the evening was given by Dr. E. M. Deloraine, technical director of the International Telephone and Telegraph Company, on the subject of "A Project for Intercontinental Telephony and Television". This interesting talk, accompanied by pertinent illustrations, explained how in the future all of the large land masses of the earth may be connected by an integrated net of coaxial cables or microwave links.

The president of the chapter, Maj Gen. F. L. Ankenbrandt, read a telegram of greeting from the president of the new London Chapter. He also voiced the regret of the chapter at the imminent departure of two of its valued members—Col. G. H. Palmer and Maj. B. J. Decker.

New officers were elected for the coming year as follows: president—Arian H. de Goede, manager, Paris Office, International General Electric; vice-presidents—General Ankenbrandt, CSO, SHAPE: Joseph R. Pernice, chief, electronics div., International Staff, NATO; Alexander de Bondini, vice-president, International Automatic Electric; honorary vice-president— Dr. Deloraine; secretary—Lt. Col. A. J. Burch, material branch, SigDiv, SHAPE; Directors are: Frank Crennan, manager, Frankfurt Office, Philco; Capt. Richard L. Henschel, photo section, SHAPE; Lt. Col. E. N. Jenkins, hq. Allied Land Forces Central Europe, Fontainebleau; M/Sgt Joseph Moroz, photo lab, SHAPE; and Col. Russell A. Purviance, communications division, Allied Air Forces Central Europe, Fontainebleau.

Sacramento

Maj. Gen. W. M. Robertson, USA (Ret.), Director of California State Civil Defense, discussed "The World Outlook for Peace and Security" at the chapter's March 1st dinner-meeting at the Sacramento Signal Depot attended by 142 members and guests.

Among the guests presents were: Al Dingle, Director of Sacramento County Civil Defense; Charles Deterding, Sacramento County Executive; and Col. E. J. Plato, USA (Ret.), Director of City of Sacramento Civil Defense.

San Francisco

Members and guests of the San Francisco Chapter met at the U. S. Naval Air Station, Alameda, on March 18th. The hospitality of the Naval Air Station was extended to the group by Lt. Cdr. G. L. Walker, station communications officer, on behalf of Capt. L. E. French, commanding officer.

Following a smorgasbord dinner, guests and new members were introduced by Elmo Simmons of the entertainment committee, and Chapter President Lloyd Parsons. Representatives of the Remler Company, Ltd., the chapter's newest group members were present and were welcomed into the chapter. Also introduced was Dr. Oleg I. Yadoff of the Applied Physics Research Foundation, who recently transferred to the San Francisco Chapter from New York.

At the conclusion of the business meeting, the group boarded buses for a tour of the communications facilities of the station. Lt. Cdr. Walker conducted the tour, assisted by Lt. Cdr. Reese, Ens. Magorian, CHRELE Wallace, Chief Fox and enlisted members of the communications department. The group saw teletype control, message center, operations tower, operations radio, and radio transmitting, and received a comprehensive description of the network of communications that ties the elements of this large air station together and links the station with other naval commands.

San Juan

San Juan, Puerto Rico, was added to the roll of AFCA chapters in March. Its charter members include representatives of the Army, Navy, Air Force, Coast Guard, Federal Communications Commission, Civil Aeronautics Administration and industry.

At its organizational meeting on March 17th, temporary officers were chosen as follows: president—Capt. A. M. Patterson, USN, commanding officer of the U. S. Naval Communication Station in San Juan, who was responsible for activating the new chapter; vice-presidents—Frederick Wilhelm, RCA Communications; and Jose Dominguez, Puerto Rico Telephone Co.; recording secretary—Capt. Edward J. Smith, USA; corresponding secretary— Lt. F. Ramirez-Rodriguez, U. S. Naval Communication Station; treasurer—Jose A. Pabon, Commonwealth of Puerto Rico, Police Dept.

Seattle

The applications of communications and photography to the work of the Federal Bureau of Investigation were discussed at the February meeting by Mark Felt, Special Agent of the Seattle office of the FBI. Mr. Felt described the overall activities and facilities of the Bureau and used as illustrations case histories of the war years in which radio communications and photography played a special part. He also emphasized the important services which the FBI provides to other agencies, such as the identification bureau, crime laboratory, etc.

At the conclusion of his talk, Mr. Felt opened the meeting to questions from the audience. The lively session which followed was indicative of the interest aroused by the program.

Southern Connecticut

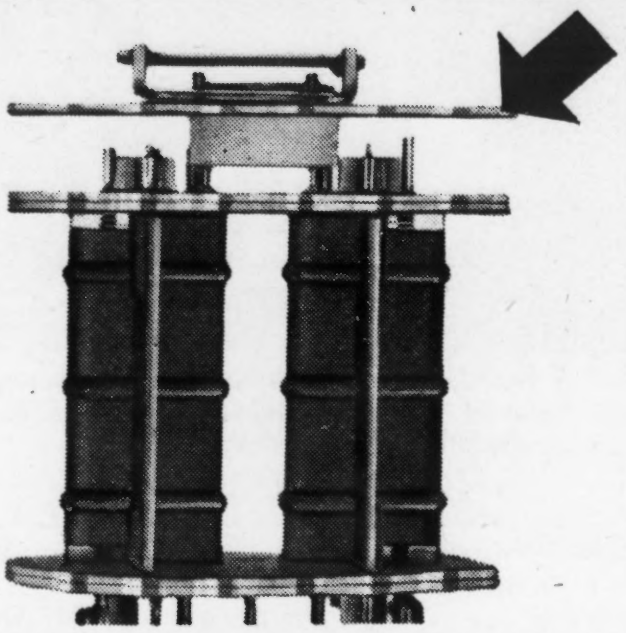
The timely subject of "Transistors"

Shown at Sacramento's March meeting, l to r: Maj. Gen. W. M. Robertson, Director of California State Civil Defense, guest speaker; Al Dingle; Chapter President Clarence P. Talbot; Charles Deterding; Col. E. J. Plato; and Col. S. N. Storbraaten.

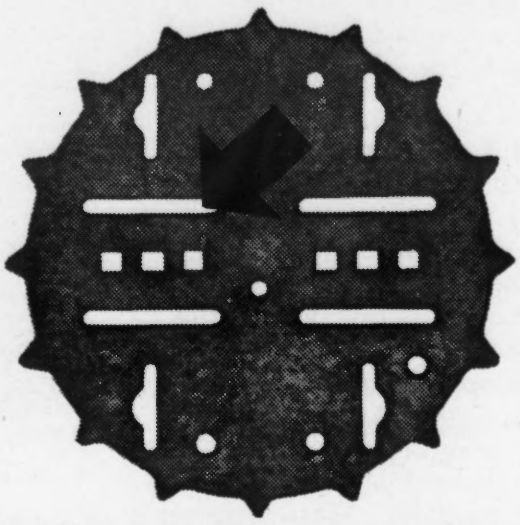
With G-E 5-Star Tubes—*

YOU ARE *Twice Protected* AGAINST PLATE-TO-GRID LEAKAGE!

* GL-5814-A, 5814-WA, GL-5751, 5751-WA, GL-6072, and others in process.



Getter flash shield keeps conductive deposits off the mica spacers.



Special slots in spacers serve as barriers across leakage paths.

End-of-life tests of G-E 5-Star Tubes must show 250 megohms resistance . . . or up to 25 times that of standard tubes!

INTERNAL electrical leakage—plate-to-grid—causes erratic, unsatisfactory tube performance. This can make electronic equipment inoperable for all practical purposes. For example, in the high-gain amplifier stages of audio circuits, tube leakage produces a hissing, "egg-frying" noise that is ruinous to clear reproduction.

● The pictures above show two safeguards *designed into* those G-E 5-Star Tubes where leakage would handicap performance—a category which includes several twin triodes. Many other special design features (see list at right) . . . plus individual parts inspection, painstaking manufacture, and rigid testing . . . give all G-E 5-Star types dependability far greater than standard tubes.

● For reliable operation of your electronic equipment, always use G-E 5-Star high-reliability tubes! Ask for them in new communications, radar, gun-control, or other apparatus! Install them as replacements! NEW tube interchange list is ready. Write for it! *Tube Department, General Electric Company, Schenectady 5, New York.*

G-E 5-Star Tubes are the most reliable you can install! Among their many design features are:

Double mica spacers at both top and bottom brace the internal structure, and enlarge the surfaces in contact with the glass envelope. Result: greater resistance to shocks and vibration.

★

In order to give General Electric 5-Star Tubes increased strength, (1) the cage is shorter, sturdier, (2) cathode is larger in diameter, (3) stops on the vertical support tabs are welded in place.

★

Getter is double-staked in order to withstand shocks and vibration.

★

Heater bends are specially coated a second time, to assure uniform insulation and prevent "shorts".

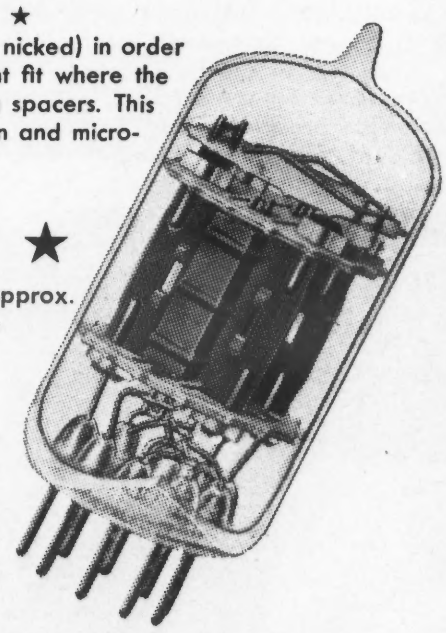
★

The grids are gold or silver-plated to prevent grid emission.

★

Grid legs are smooth (not nicked) in order to assure a continuing tight fit where the legs pass through the mica spacers. This cuts down on grid vibration and microphonic noise.

★ ★ ★ ★ ★



G-E 5-Star Tube, shown approx. 1½ times actual size

GENERAL ELECTRIC

164-1A3

was the theme of the chapter's March 16th meeting, with Wilson T. Rea, Director of Military Communication Development, Bell Telephone Laboratories, as the featured speaker. Mr. Rea has been close to transistor development work since its beginning and is one of the most authoritative men on this important electronic subject in the East. This was his third lecture on transistors before an AFCA chapter, having addressed the Chicago and New York Chapters earlier in the year.

The dinner-meeting was held at the Quinnipiack Club in New Haven and was attended by seventy members and guests who represented the local industrial and military establishments.

South Texas

The inaugural dinner-meeting of the South Texas Chapter was held at the Officers' Club, Fort Sam Houston, on March 31st, with 137 members and guests in attendance. Host for the occasion was Col. George L. Richon, Fourth Army Signal Officer, who headed the chapter organization committee.

Dr. Harold Vagtborg, president of the Southwest Research Institute, was the principal speaker. He discussed the role of science and research in the world today, and stressed the need for basic research and the use of imagination in expanding the horizon of the so-called unlimited frontier.

A slate of officers to direct the chapter's first year of activity were submitted by S. H. Simpson, Jr., Southwest Research Institute, chairman of the nominating committee, and was unanimously accepted. The officers are: president—Colonel Richon; vice-presidents—Trevor H. Clark, associate director, Southwest Research Institute; Howard Davenport, military activities engineer, Southwest Bell Telephone Co.; Col. Francis B. Morgan, command communications officer, USAF Security Service; and Capt. William H. Sublette, comamnding officer, U.S. Naval and Marine Corps Reserve Training Center; secretary—Grover Krone, chief, maintenance division, Signal Section, San Antonio General Depot; treasurer—Lt. Col. Charles A. Wingo, Assistant Signal Officer, Fourth Army.

Committee chairmen were appointed by the new president as follows: program—S. H. Simpson, Jr.; publicity—Grover Krone; membership—S. J. Keane, Southwest Research Institute; civil defense—Howard Davenport; constitution and by-laws—Lt. Col. Wingo.

Tinker-Oklahoma City

The Southwestern Bell Telephone Company was host to the chapter on March 25th. A guided tour of the plant covered such items of interest as the new 4-A toll dialing system and television terminal facilities. At the completion of the tour, the ninety members and guests enjoyed an informal get-together in the company cafeteria, with refreshments served through the courtesy of the host company.

Carl Atkinson, temporary president of the chapter, presided over the business meeting and announced the results of the first regular election of officers as follows: president—Brig. Gen. Thomas L. Bryan, Jr., commander, 1800th AACS Wing; vice-presidents—James J. Nichols, defense coordinator, Southwestern Bell Telephone; Frank Rohrer, general manager, Western Union; Col. P. H. Christiansen, base communications officer, OCAMA; H. D. Maxwell, ground communications engineering, OCAMA; secretary—Al Woods, Philco Tech Rep, 1800th AACS Wing; treasurer—Carl Klepzig, ground communications engineering, OCAMA. Board of Directors—E. F. Hilmes, OCAMA; John Layden, Western Union; Lt. Col. John A. Hensler, 1800th AACS Wing; Del Cravens, Southwestern Bell; Bill Dayton, Philco Tech Rep; Maj. James Mercer, AACS.

In accepting the presidency and the chapter charter, General Bryan complimented the original officers for their guidance of the chapter in its initial growth and activity.

At an executive committee meeting on April 8th, plans were made for future meetings and committees were set up to complete the organizational setup as follows: Membership—Frank Rohrer, chairman; Maj. Terrill, asst. chairman; Reno Park, R. H. Brackhage, R. L. Jarrell and John Mercer. Program—Lt. Col. Christiansen, chairman; Del Graven, Col. David M. Crabtree, Jr., and A. L. Woods. Constitution and by-laws—A. L. Woods, chairman; Lt. Col. Hensler and Roy L. Jones.

San Francisco Chapter met at the U. S. Naval Air Station in Alameda on March 18th. A smorgasbord dinner was followed by a comprehensive tour of the communications facilities of the station.

Washington

The program of the chapter's March 3rd luncheon-meeting was an official Air Force presentation of the Weapon System and Supporting System Concept. The authoritative speakers, who came from Wright Air Development Center for the meeting, were: Colonel H. A. Boushey, Director of Air Weapon Systems; R. A. Shultz, Technical Director for Piloted Weapon Systems; and P. R. Murray, Technical Director for Pilotless Weapon Systems.

Colonel Boushey and his associates defined the System Concept and outlined the procedures by which the Air Force procures the development and production of items of equipment for systems and the utilization of a prime contractor for the over-all systems integration. In addition, the presenta-

South Texas Chapter officials shown at inaugural meeting on March 31st. L to r: Lt. Col. Charles A. Wingo, treasurer; Howard Davenport, vice president; Grover Krone, secretary; Col. F. B. Morgan, vice president; Col. George L. Richon, president; Dr. Harold Vagtborg, president, Southwest Research Institute, guest speaker; Capt. W. H. Sublette, USN, vice-president; M. G. McGee, vice-president; Steve Simpson, program chairman; S. L. Keane, membership chairman.

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Reliability
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Close tolerance parallelism between electrodes prevents uneven heating at high frequencies, minimizes arcing.

Uniquely processed grid, mechanically stable at high temperatures, assures frequency stability over broadest range of operating conditions.

Machined emitter surfaces with extremely uniform oxide deposit assure optimum cathode emission as well as freedom from uneven, grid distorting, heat.

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Average strength of the ML-2C39A is over 400% greater than *any other* 2C39A, as measured in torque and pry tests.

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Quality in design, materials, and production techniques build superior reliability into the ML-2C39A.

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Electrical Characteristics of ML-2C39A*

Heater voltage, 6.3 volts	Grid-plate capacitance, 2.0 uuf
Amplification factor, 100	Maximum frequency, 2500 mc/sec
Transconductance, 22,000 umhos	Useful power output, 12-35 watts

**Manufactured to JAN specifications.*

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tion covered to some degree the "why" of the System Concept and certain well defined steps in its evolution.

Distinguished guests at the head table were: Col. G. J. McClernon, Chief, Production Engineering Division, USAF; Capt. Rawson Bennett, Asst. Chief, Bureau of Ships for Electronics; Brig. Gen. A. L. Pachynski, Deputy Director of Communications, USAF; Rear Adm. B. E. Manseau, Deputy and Asst. Chief, Bureau of Ships; Maj. Gen. J. E. Briggs, Asst. Deputy Chief of Staff for Development, USAF; Rear Adm. R. E. McShane, Director, Planning and Coordination Division, Office of Naval Material; and H. B. McCoy, Deputy Administrator, Business and Defense Services Administration, Department of Commerce.

The chapter's April 7th meeting was addressed by William H. Martin, Deputy Assistant Secretary of Defense for Applications Engineering.

Describing the objectives and responsibilities of applications engineering in the Defense Department's research and procurement activities, Mr. Martin stressed that the aims of the applications engineering organization are to have the highest quality and least complex equipments for the armed forces, and at the same time to save the taxpayers through standardization and continuous surveying of military expenditures.

Special guests of the chapter were: Maj. Gen. Leslie E. Simon, Chief, Research and Development, USA Ordnance Dept.; Rear Adm. M. F. Schoeffel, Chief, Bureau of Ordnance, Navy Department; Rear Adm. F. R. Furth, Director, Office of Naval Research; Brig. Gen. W. P. Corderman, Chief, Engineering and Technical Div., OCSigO; Maj. Gen. J. D. O'Connell, Deputy Chief Signal Officer; Frank D. Newberry, Assistant Secretary of Defense for Applications Engineering; Capt. Rawson Bennett, Asst. Chief. Bureau of Ships for Electronics; L. S. Taylor, Bureau of Standards.

Transistors were discussed at Southern Connecticut's March meeting by Wilson T. Rea of Bell Telephone Labs. L to r: Mr. Rea; W. W. Wren, vice president, Southern New England Telephone Co.; and Col. Edgar L. Love, chapter president.

Student Chapters

Iowa State College

Members of the Iowa State College Chapter have had the opportunity to gain first-hand information about foreign countries from slides and movies taken by members of the ROTC instructor group during their overseas tours of duty.

To date, Major W. T. Hartman. chapter advisor, has entertained the group with a collection of slides taken in Formosa; Capt. Robert Yeasley has shown movies taken in several western European countries; and a discussion of experiences in Korea was conducted by Cadet Richard Wegman.

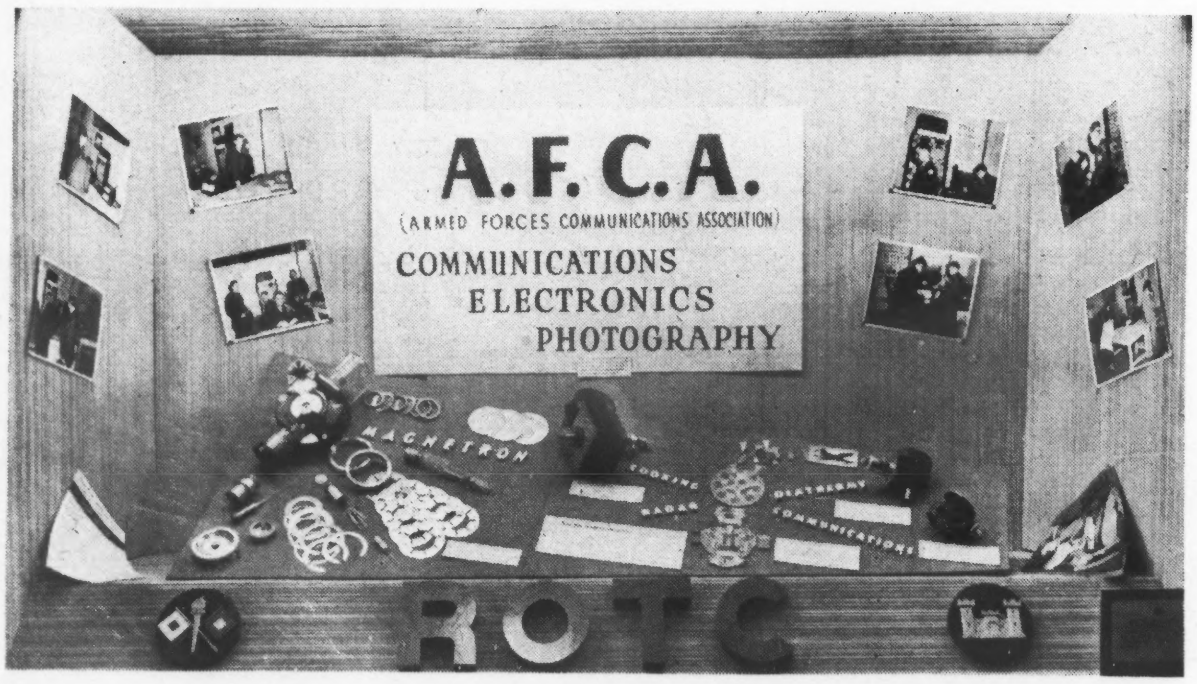
The chapter has initiated a weekly "movie hour", with films obtained from the Fifth Army film service.

Northeastern University

Chapter activities and interest at Northeastern have reached a new high since the appointment of WOJG John M. Wilson of the ROTC Instructor Group as faculty advisor last fall.

The following activities during the first quarter of 1954 indicate the broad scope and enthusiastic manner in which the chapter is operating: January 11—February 8: AFCA display on the Magnetron to Northeastern students and faculty. The Raytheon Manufacturing Co., AFCA group member, assisted in producing this display (see photo). February 10—regular meeting; combat film was shown. February 17—regular meeting; talk on "TV Skyways". February 24—field trip conducted to view Army radio facilities at Castle Island, South Boston. March 3—regular meeting—speaker from Cambridge Thermionics discussed "Electronics Components Manufacturing". March 5—annual banquet of the chapter, held at Charlestown Naval Officers' Mess. Principal speaker was Lt. Col. Angus Walker, SigC (Res) on "Combat Photography". Special guests were Raymond Meader, president of the Boston Chapter and Col. M. D. Harris, PMST, Northeastern University. March 10—Colonel Harris spoke on the aims and objectives of the AFCA. March 17—Combat film, "Battle of San Pietro", was shown by Mr. Wilson. March 24—field trip to Boston Harbor aboard U. S. Army boat. March 31—closing meeting of winter term.

Photograph of Northeastern University Chapter's display window featuring the Magnetron. The Raytheon Manufacturing Company assisted the student chapter members in producing this exhibit.



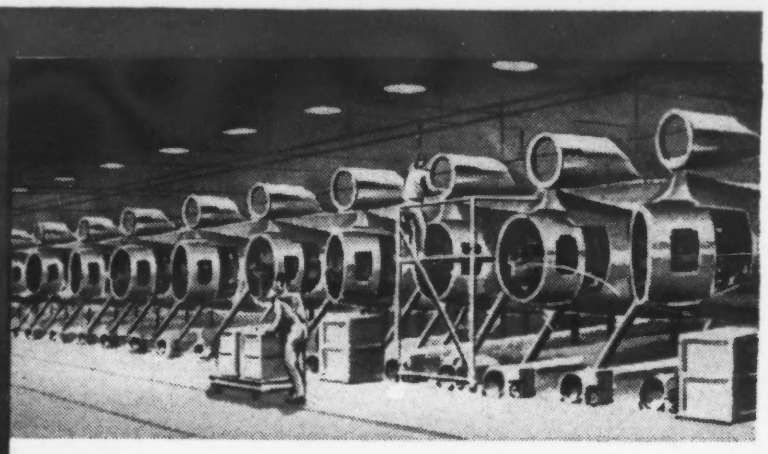
Norwich University

A student chapter was chartered at Norwich University on March 31st. The chapter was organized through the efforts of David W. Luce who had been awarded the AFCA bronze medal in 1952 as the outstanding sophomore ROTC cadet majoring in communications and electronics at the university.

The chapter completed its organization at a meeting on March 29th. Constitution and by-laws were adopted, and officers were elected as follows: president—David Luce; 1st vice president—Wilbur Edel; 2nd vice president—Alfred Ward; secretary—William Altman; treasurer—Donald Douglass.

The General Electric film "And A Voice Shall be Heard" was shown at the conclusion of the business session.

deadly trigger finger..



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NEWS

Communications-Electronics-Photography

LOGEX-54 MANEUVER PLANNED BY SIGNAL CORPS

The Signal Corps played a leading role in this year's LOGEX logistical training exercise, since it was charged with the responsibility of planning and conducting the annual maneuver. Brig. Gen. Wesley T. Guest, Commandant of the Signal School at Fort Monmouth, served as Maneuver Director. The Army Field Forces exercise was planned at Fort Monmouth and held May 3-8 at Camp Pickett, Va., which has been its site since 1952. Some 4,000 persons participated.

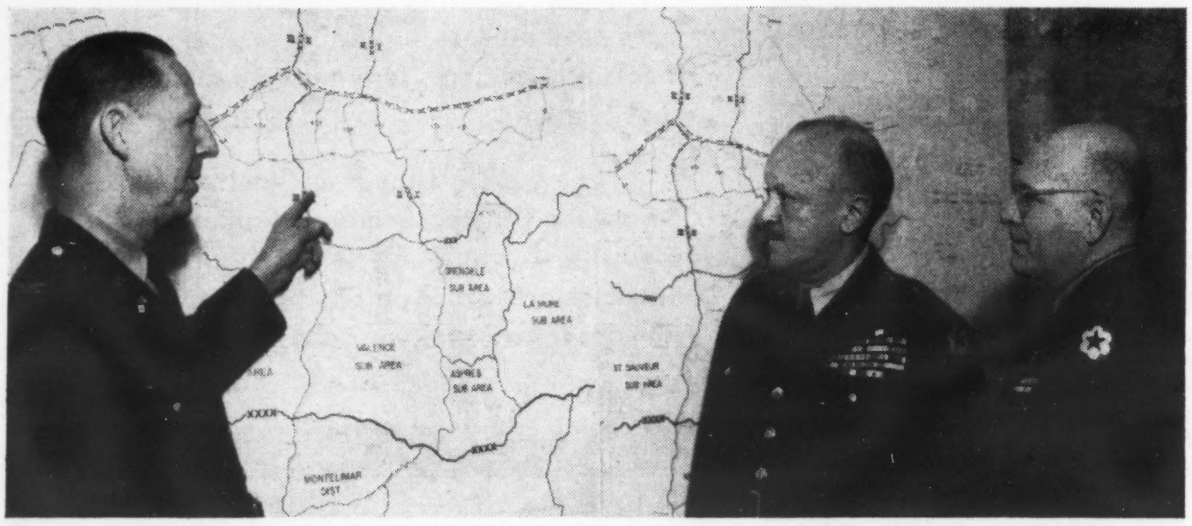
Like the previous maneuvers, LOGEX-54 provided practical experience to student officers of the schools of the Army's technical and administrative services, and selected Army Reserve personnel, in supporting an Army of 400,000 men with the supplies and services required to maintain continuous operations during six days of combat.

The combat situation for LOGEX-54 assumed that a Type Field Army had landed at Marseilles, France, to wrest the southern Rhone Valley from an aggressor which had overrun nearly all of Europe. The plan called for the fighting units to push forward, and on D-Day plus 63 the student officers at Camp Pickett took over the logistical support of the simulated Army.

Troops in the field were simulated for the problem, but the problems of logistical support were realistic and it was up to the students to solve them. Utilizing maps, charts, and strategic data, the students held staff positions in supply and service headquarters of a simulated Type C Logistical Command and a simulated Type Field Army, and carried out the support the Army needed to push back a hypothetical aggressor who waged war with modern mass-destruction weapons.

The entire exercise was carried out in a group of some 35 buildings at Camp Pickett, interlinked with a communications system of 800 telephones, 50 teletypes, and other facilities installed and operated by the 313th Signal Operations Battalion of the Second Army.

Maj. Gen. Robert W. Colglazier, Jr., Deputy Assistant Chief of Staff, G4, at Department of the Army, was the chief control officer of the maneuver. Among the many high ranking military personnel who observed the maneuvers were Maj. Gen. George I. Back, Chief Signal Officer, Brig Gen. R. P. Lyman, Chief P&O Division, OCSigO, and Maj. Gen. Kirke B. Lawton, Commanding General of Fort Monmouth.



Col. Robert A. Hill, chief of the LOGEX-54 plans division, points out the supply distribution program to Brig. Gen. Wesley T. Guest, Maneuver Director, and Col. Harold C. Miller, Chief of Staff.

Federal M. & E. Enters Military Package Field

Federal Manufacturing and Engineering Corporation of New York has recently announced the formation of a Transit Case Division.

Heavily engaged in the production of electronic and photographic equipment for the Armed Forces, this company has evolved a plan to convert what was formerly a $1,000,000 packing expense into a profitable business.

To launch the new division, Federal has set aside 35,000 square feet of manufacturing space to be devoted exclusively to production of transit cases made to rigid military specifications. These cases, according to Government specifications, are to be made of plywood and aluminum, and equipped with rubber mounts to ease the shock of a drop from aircraft or fast-moving trucks in a war zone.

In addition to supplying its own transit case needs, Federal will make these containers available to other producers of defense material.

Stanford Research Institute and Air Force Sponsor Symposium

A "Symposium on Automatic Production of Electronic Equipment" was held last month in San Francisco.

The meeting was sponsored by Stanford Research Institute at the request of the United States Air Force. It was designed to provide a meeting place where industrial administrators and engineers as well as military leaders could learn details of the various automatic assembly systems currently under development in the United States.

The program included discussions of unclassified developments in automation as well as suggestions for future applications related to the production of electronic equipment.

Major General D. N. Yates, USAF, Director of Research and Development under the Deputy Chief of Staff, discussed the military's interest in automatic production.

Among the papers which were presented at the symposium were: "The Impact of Automatic Control on Industry", "An Approach to Automatic Production of Electronic Equipment", "Mechanical Assembly of Electronic Components", and "Automatic Production of Audio Transformers."

New Pulse Transformers for Digital Computers

A new line of standard and miniature hermetically-sealed pulse transformers for digital computer applications has recently been announced by the Sprague Electric Company.

(*Continued on page* 60)

Designed for use in high speed circuits utilizing pulses of from 0.1 to 20 microseconds duration, the new units provide an exceptional degree of reliability.

The miniature Type 10Z transformers are primarily engineered for use in flip-flop, buffer, pulse amplifier, and gating circuits, with pulse duration of from 0.1 to 0.5 microseconds. Hermetically-sealed, the units are housed in corrosion-resistant cans with glass-to-metal solder-seal terminals at each end. Can length is ¾" and diameter is ½". Transformers can be mounted and supported by the lead wires in most applications.

The larger Type 20Z pulse transformers are designed for blocking oscillator circuits, push-pull memory ring driving circuits, and other applications requiring fast rise time with minimum pulse lag and decay, with pulses up to 20 microseconds in length. These hermetically sealed units are housed in drawn-metal shell "bathtub" cans measuring 1¾" x 1¼" x ½", chassis mounting ears being available. In addition, special plug-in units and other housing configurations can be manufactured to individual customer specifications.

Hammarlund Introduces Alarm Unit For Remote Control System

An alarm system to quickly report any malfunction in unattended operation of equipment, and warn of breakdowns of remote control telemetering apparatus, is now available from The Hammarlund Manufacturing Company of New York City.

Power failure, excessive temperatures, fire, failure of control equipment, abnormal system conditions, unauthorized entry, and automatic transfer to standby equipment are typical conditions that are quickly brought to the attention of the supervisory staff by the use of this new equipment.

The basic alarm system consists of a battery-powered tone transmitter and a frequency selective receiver with a suitable alarm display. These two pieces of terminal equipment may be joined by a standard telephone circuit or the equivalent. The system may be expanded by the addition of a coding unit at the transmitting end for classification of the types of failure involved.

Information is transferred from transmitter to receiver either as a continuous 1000-cycle audio tone, or as an interrupted 1000-cycle tone, depending on the coverage required and the degree to which the character of failure must be identified.

Aircraft-Marine Introduces New Insulated Terminal

A new insulated terminal for users of heavy duty wire has been developed by Aircraft-Marine Products, Inc. of Harrisburg, Pennsylvania.

The manufacturer states that this new terminal known as "Ampli-Bond" gives a positive and complete bond of the insulation to the terminal sleeve, insures uniform insulation thickness under confined crimping pressures, and therefore transmits this pressure evenly to the center of the crimp area.

Insulation designed to extend minimum distance beyond terminal barrel, provides maximum permanent support and allows the use of large size wire in restricted areas. Completely separate metallic ring grips wire insulation, prevents exposure of conductor during sharp bends and cable fatigue caused by excessive flexing and vibration. This non-conducting ring forms a barrier to foreign objects coming in contact with current carrying members. A tough vinyl insulation is used that will withstand a minimum of 6000 volts, which is four times the military specification for insulated terminals.

Safety Tower Ladder Company Introduces New Safety Devices

The Safety Tower Ladder Company, of Burbank, California, has placed on the market two new safety devices.

One of these is the Safety Lifeline Lock, a device to prevent injury if a workman falls or a scaffold fails. In use, it slips on to the Lifeline rope and moves along the rope with the workman, either up or down, as he slides it to the desired working position.

Falling causes the device to lock instantly, automatically and positively, holding him safe.

The other safety device is the Tower Ladder Safety Device, engineered to save lives and prevent injury to men who work on high ladders and structures.

IRE Convention Has Biggest Radio Engineering Show in the World

Over forty thousand radio engineers and scientists gathered in New York to attend the Convention of the Institute of Radio Engineers.

More than four acres of floor space at the Kingsbridge Armory was needed for approximately 600 exhibits, comprising interesting and novel electronic equipment ranging from the tiniest new transistors to complete broadcasting stations.

Dr. Alfred N. Goldsmith, co-founder of the IRE, received the Founder's Award and delivered the major address at the annual banquet. Speaking on the topic, "IRE—Past and Future," Dr. Goldsmith foresaw many fields in which electronics may bring great advances. Radio astronomy may be of service in interplanetary travel; economic studies and even weather prediction will be carried on more and more by means of elaborate computers.

243 papers on topics ranging from color television, transistors, ultrasonics, medical electronics, and "automation," the automatic factory of the future, were discussed.

For a report on photography at the IRE convention, see page 72.

Micro-Switch Designs Heavy-Duty Limit Switch

A new two-circuit heavy-duty limit switch and a new two-circuit basic switch have been introduced by Micro Switch of Freeport, Illinois, a division of Minneapolis-Honeywell Regulator Company.

The heavy-duty limit switch (identified as catalogue listing 101ML1) combines precision, two-circuit switching with rugged construction. Use of a snap-action spring accomplishes simultaneous make and break of both contacts (of both the normally-closed and normally open circuits). The switch's durable aluminum enclosure makes it particularly useful as a control of two isolated circuits in applications where the switch is subjected to severe shock and impact.

Global Communications Symposium To Be Held in June

Nearly 1000 radio engineers are expected to attend the first symposium on Global Communications, which will be held in Washington, D. C., June 23-25.

It will be sponsored by the Institute of Radio Engineer's Professional Group on Communications Systems.

Technical papers on various aspects of world-wide communications will be presented in two full-day sessions by commercial, military, and other Government specialists in the field. Arrangements are being completed for conducted field trips to nearby commercial and military communications centers.

Further information can be obtained from Mr. Charles DeVore, Naval Research Laboratory, Washington 25, D. C.

AFCA Members Available to Industry

In this new feature of SIGNAL, we open the pages of our AFCA journal to the *members* of the Association who are seeking positions in the communications, electronics or photographic industries. Any member is entitled to space free of charge in this column. Please limit your entry to five lines.

RESERVE COFMMANDER, now active duty. Aeronautical communications/electronics specialist. Airline and CAA background. Private pilot. Managerial or company representative type work preferred. Box 101, SIGNAL.

FIFTEEN YEARS' EXPERIENCE in sales promotion available for executive position with small company where he can promote commercial and government sales. Good contacts and achievement in Government procurement. Formed top nation-wide organization for commercial sales. Box 102.

GROUP MEMBERS' PERSONNEL CHANGES

V. M. Lucas has been appointed Manager of Marketing for the Heavy Military Electronic Equipment Department of the ***General Electric Company*** . . . Henry Magnuski has recently been named Associate Director of Research in the Communications and Electronics Division of ***Motorola.***

The Board of Directors of ***Radio Receptor Company, Inc.*** has appointed Ralph Mendel Vice President in charge of the Engineering Products Division. . . . The appointment of Edouard P. Genock to head television production at ***Eastman Kodak Company*** was announced recently by W. B. Potter, Advertising Director.

William B. Shantz has been named to the executive staff of ***Ampex Corporation's*** sales division, according to an announcement by Harrison Johnston, General Sales Manager. . . . Meade Brunet, Vice President of the ***Radio Corporation of America*** announces the appointment of H. C. Edgar and Albert F. Watters to newly created administrative positions in the RCA International Division.

Daniel E. Noble, Vice President of ***Motorola's*** Communications and Electronics Division, has announced the appointment of Lloyd P. Morris to the position of Chief Engineer of a new Motorola service, the National Radio Systems Consulting Service.

The appointment of William V. Ryan to the newly created position of Military Electronics Representative has recently been announced by E. G. Fossum, General Manager of ***Stewart-Warner Electric***, the radio, television and electronics products division of Stewart-Warner Corporation.

Mercer Brugler has recently been elected a member of the board of directors of ***Stromberg-Carlson Company***. . . . Lee K. Alexander has been appointed Manager of Marketing for the ***General Electric*** Light Military Electronic Equipment Department.

The appointment of John F. Morten as Marketing Services Manager of the Equipment Sales Division of ***Raytheon Manufacturing Company*** was announced by D. J. Webster, Marketing Manager. . . . Robert Paulson has joined the New York district office of ***Ampex Corporation*** as Manager of audio sales.

W. H. Mackin has been appointed Sales Manager of the Holtzer-Cabot Telephone Equipment Division of the ***National Pneumatic Company***. . . . ***Lenkurt Electric Company*** announces the appointment of Alden Bowser as Engineering Representative of the Lenkurt Electric Sales Company.

Raytheon Manufacturing Company announces that Clark C. Rodimon has been appointed staff assistant to the Manager of government contracts.

TELEVISION

MOTOROLA UNVEILS NEW COLOR TV SCANNER

Motorola, Inc. recently unveiled its new flying spot film scanner for color TV projection.

The scanner, developed by engineers of the company's Communications and Electronics Division, is an all-electronic device that will now permit high quality projection of TV programs from 16mm color films.

The device employs a synchronizing flying spot scanner as a light source. This all-electronic technique, as opposed to start-stop or fast pull-down techniques, permits continuous film motion with a corresponding minimum film wear.

A servo-control system positioning the scanning light source in synchronism with film motion provides complete picture stabilization and automatic correction for film shrinkage. Because of the absence of moving optical parts in the light path, the full opening of the projector lens aperture is possible.

A unique jump scan technique is used to convert the 24 frame per second film standard to 30 frames per second required in television broadcasting.

Motorola engineers began developmental work on the new studio projection equipment over two years ago. The unit recently demonstrated is an experimental model used to date primarily in the company's color television receiver development program.

TV Trouble Shooting by Telephone

A new system which enables a TV set owner to identify reception troubles of a color television or black-and-white set to a repairman, over the telephone, has been demonstrated by the Raytheon Manufacturing Co.

The system promises to remove most of the expected difficulties in servicing the highly complicated color TV receivers that are now reaching the consumer market.

Called the Raytheon "Service Saver" plan, it is already proving highly effective in reducing time delays and costs of repairing conventional black-and-white sets.

The system works as follows: The purchaser of a TV set gets a Raytheon "Service Saver" booklet containing a series of 40 numbered pictures of defective picture reception. These 40 pictures represent almost every conceivable type of trouble that might show up on a television screen. If the owner has trouble with his set, he identifies the actual disturbance on the screen, calls the repairman and gives him the number of the picture that represents the condition.

The repairman has a technical version of the "Service Saver" booklet, containing the same series of pictures, which permits him to identify the tube or circuit which is causing the trouble.

The vastly more complex structure of a color receiver inevitably will produce increased sources of possible circuit or tube service requirements.

The new "Service Saver" plan is expected to simplify greatly the problems of television maintenance.

TV Interference Studied by American Radio Relay League

A demonstration of the causes and cures for interference to television reception was staged recently by the American Radio Relay League staff. The demonstrations were held at meetings for service technicians and amateur radio operators in fourteen major western cities.

Picture interference from electric shavers, carbon-filament light bulbs, short-wave radio transmitters, diathermy, and f.m. broadcasts were among the sources which were demonstrated as having distinctive and identifiable patterns. Slide illustrations showed the circuit difficulties and their remedies.

Also demonstrated was the manner in which some television receivers interfere with other radio services, and on occasions even with themselves.

The tour covered the far western portion of the country. In the area covered, nearly every city with low-band channels in operation was reached.

The League undertook the tour as a method of informing service technicians about interference problems, and to correct their practice of erroneously identifying any and all picture interference as "probably some amateur."

The major equipment components for the demonstration were two receivers, miscellaneous apparatus such as electric shavers and small broadcast receivers, and a complete amateur short-wave transmitter of modern design.

One TV receiver had adequate built-in selectivity while the other did not. It was shown that when the short-wave transmitter is operated immediately adjacent to the receivers, the picture on the model with inadequate selectivity may be completely

(*Continued on page* 66)

20-INCH COLOR TV TUBE UNDER DEVELOPMENT BY WESTINGHOUSE

A new color television picture tube that produces a 20-inch (diagonal) color picture, comparable in contour and size to the standard 21-inch black-and-white tube, is under development by the Westinghouse Electronic Tube Division. The developmental tube is a directly-viewed tricolor tube employing a single gun and deflection-grid color pack.

A significant advancement in the new tube is its larger screen size coupled with the use of a phosphor screen which has 20 complete color groups per inch compared to 17 previously used. This gives improved resolution and excellent color definition at normal viewing distances. The total viewing area of the screen is approximately 200 square inches.

The overall size of the tube has been held to a minimum by using a 24-inch (diagonal) rectangular metal cone and 70-degree deflection.

The screen of the tube consists of lines of three color phosphors which produce the colors red, green, and blue. The lines, 80 to the inch, are alternately deposited on a flat glass plate by either silkscreen printing, or a photographic process.

The complete color-pack assembly includes the beam-deflecting wire grid, mounted parallel to the phosphor lines, so that the grid is between the screen and the gun.

A 3.58-mc sine wave signal applied to the grid deflects the beam alternately over the three color phosphors. Color information is applied sequentially to the single gun in synchronism with the 3.58-mc switching signal so that at the instant the beam is focused over one of the phosphors. it is carrying the appropriate color information.

Grandpa's family now numbers millions...

The contented old gentleman relaxed in his 1924 living room probably had little knowledge of the *technical* details which made his radio work. Much less did he realize that they were forerunners of the magical entertainment which his grandchildren would *see* and *hear* in the 1950's.

Things like totally shielded chassis construction, automatic volume controls, pre-selective tuning and built-in phonograph jacks—these were part of the original Stromberg-Carlson radio family and they have passed down to you, in today's living, a wonderful heritage of quality.

The five-dial radio receiver shown on the table in the illustration above was a very popular set in the 20's—even though you had to read a twenty-seven page instruction book before you could tune in Clara, Lu and Em! Quite a contrast with the 1954 *"Panoramic Vision"* 21-inch TV, where a mere flip of two dials brings you clear, distortionless, locked-in picture and sound—and eventually will provide the world's finest free entertainment for you in full color!

You who enjoy this Stromberg-Carlson television receiver today are profiting from the ingenuity of the engineers who developed the first Stromberg-Carlson radio—and never stopped searching for ways to improve it!

And you can be sure that no matter how this great family line increases, no matter what tomorrow's products will be called—or what they will *do*—they'll still show the keenest know-how in the whole world of Communications; and still be true to the family motto, "There is nothing finer than a Stromberg-Carlson."

There is nothing finer than a

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STROMBERG-CARLSON LEADS TOO IN:

Telephones and Central Office XY Dial Equipment

High Fidelity Radios and Radio-Phonographs

Office Intercom Equipment

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Sound and Public Address Systems

wrecked, while the other produces a good picture with no discernible interference. Adding a simple high-pass filter to the first receiver can clear it up also.

Early tests with u.h.f. have shown greatly reduced potentialities for interference to picture reception from outside sources, so the League is concentrating on cities with low-band v.h.f. channels. In the majority of cases, installation of a high-pass filter to increase the selectivity of the television receiver is all that is needed to overcome most if not all of the interference which might be experienced. However, the used of dual-conversion channel strips to permit u.h.f. reception with a v.h.f. receiver, a procedure contrary to FCC engineering standards, often produces an interference problem needing special treatment.

RCA BEGINS PRODUCTION OF COLOR TELEVISION SETS

The production of the Radio Corporation of America's first commercial color television sets began during March as the initial step in a comprehensive program to bring color television into American homes.

RCA revealed its color plans to seventy competing manufacturers. Detailed engineering and manufacturing information on RCA's first commercial model — the CT-100 — was given to these RCA licensees. A full report was made on RCA's manufacturing plans and on the National Broadcasting Company's plans for colorcasting.

RCA has announced that it plans to manufacture during 1954 about five thousand 15-inch color receivers and about five thousand 19-inch color receivers.

Shipment of color sets have already started. Initial deliveries will go to RCA distributors in areas where network color signals can now be received. Already color reception is possible in 35 large cities from the Atlantic to the Pacific Coast. It is estimated that by the end of 1954, 125 TV stations will be equipped for color broadcasts, providing coverage for 75 per cent of American homes.

J. B. Elliott, RCA Executive Vice President, Consumer Products, stated that the demand for color sets in 1954 will probably exceed the supply. During 1954, he said, the industry should be able to sell 70,000 units, in 1955 about 350,000 and in 1958, sales should reach about 5,000,000.

During February RCA passed the 2,000-a-month rate in the production of tricolor picture tubes. This was achieved three months ahead of schedule.

RCA's most popular 21-inch black-and-white set now in production uses a total of 437 parts, including 19 tubes and approximately 63 feet of wire. The CT-100 color receiver has a total of 1,012 parts including 35 receiving tubes and the 15-inch color tube, along with approximately 150 feet of wire.

Installed in RCA's Bloomington, Indiana plant, at a cost of more than $500,000, is a newly developed test unit to permit factory tuning of color television sets to insure faithful color reception. The equipment is, in effect, a small-size television station which can transmit color test patterns over a closed-circuit in the plant.

Insuline Corporation Develops New TV Antenna

Existing VHF television aerials can be converted for the reception of UHF stations by the addition of the "Combo-Fan," a new product of the Insuline Corporation of America, of Manchester, New Hampshire.

This is a fan-shaped, weather-proof, all-aluminum antenna giving high gain on channels 14 through 83 without affecting normal operations on channels 2 through 13. The unit includes a printed circuit filter that permits the use of the present VHF down-lead to the receiver.

The "Combo-Fan" is easily installed above or below the VHF antenna by means of a mounting bracket provided for the purpose. Vent holes in the two fans minimize picture flutter due to wind.

Willys Introduces Photoconductive TV Camera Chain

The Electronics Division of Willys Motors, Inc. recently announced the development of the new model UK-1A photoconductive camera chain. This new chain includes camera with cables, friction head and dolly, camera control monitor and synchronizing generator.

The chain has been especially developed for the television broadcaster and can be used for both live studio pickup and motion picture film. Its application can be foreseen in commercial telecasting and closed circuit television training programs.

The camera features electronic viewing and employs a 7-inch direct view screen. Mounting can be made on any standard tripod or dolly by one man as total weight of the camera is under 40 pounds. All controls except mechanical focus are located on the illuminated control panel below the camera viewing screen.

The camera housing measures 9 x 13 x 22 inches and is adequately vented and cooled. Sides of the housing are hinged and all components are exposed when the louvered sides are opened.

The camera control unit features separate viewing screen for observing horizontal and vertical wave forms. All controls are clearly marked and arranged for convenient operation. The control monitor can be mounted in a standard studio control console desk or fitted into a special portable carrying case for use outside the studio.

Since the power supply is self-contained, the synchronizing generator can be rack mounted or used in the field in a portable carrying case.

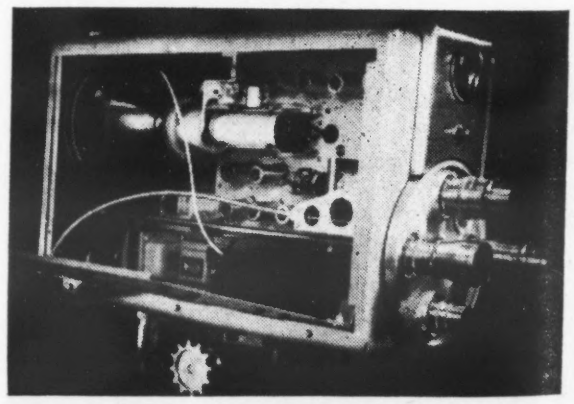
RCA Color TV Clinics Draw Record Crowds of Technicians

More than 27,000 television servicemen have attended the first 35 sessions in a nationwide series of technical clinics on installation and maintenance of color television receivers sponsored by the Radio Corporation of America. (See article in March-April 1954 SIGNAL.)

Similar clinics in a total of 65 major cities are scheduled in the series presented by RCA for servicemen-dealer customers of RCA Tube and RCA Victor Home Instrument distributors. These distributors sponsor the meetings locally.

In addition to large attendance at the clinics, instructional material prepared for use in the company's TV training program has received wide acceptance throughout the service industry.

An example of this is the textbook, *Practical Color Television for the Service Industry*, which is presented to servicemen who complete the clinics, and is also available either through RCA parts and tube distributors or directly from the RCA Service Company.



Interior view of the new Willys Model UK-1A television camera. The sides of the housing are hinged and all components are exposed when the louvered sides are opened as shown above.

Brig. General David Sarnoff, Chairman of the Board, Radio Corporation of America

Sees No. 1 wish come true!

Television Tape Recording by RCA Opens New Era of Electronic Photography

In 1956, RCA's General Sarnoff will celebrate his 50th year in the field of radio. Looking ahead to that occasion, three years ago, he asked his family of scientists and researchers for three gifts to mark that anniversary: (1) A television tape recorder, (2) An electronic air conditioner, (3) A true amplifier of light.

Gift No. 1—the video tape recorder—has already been successfully demonstrated, two years ahead of time! Both color and black-and-white TV pictures were instantly recorded on magnetic tape without any photographic development or processing.

You can imagine the future importance of this development to television broadcasting, to motion pictures, education, industry and national defense. And you can see its entertainment value to you, in your own home. There the tape equipment could be used for home movies, and—by connecting it to your television set—you could make personal recordings of your favorite TV programs.

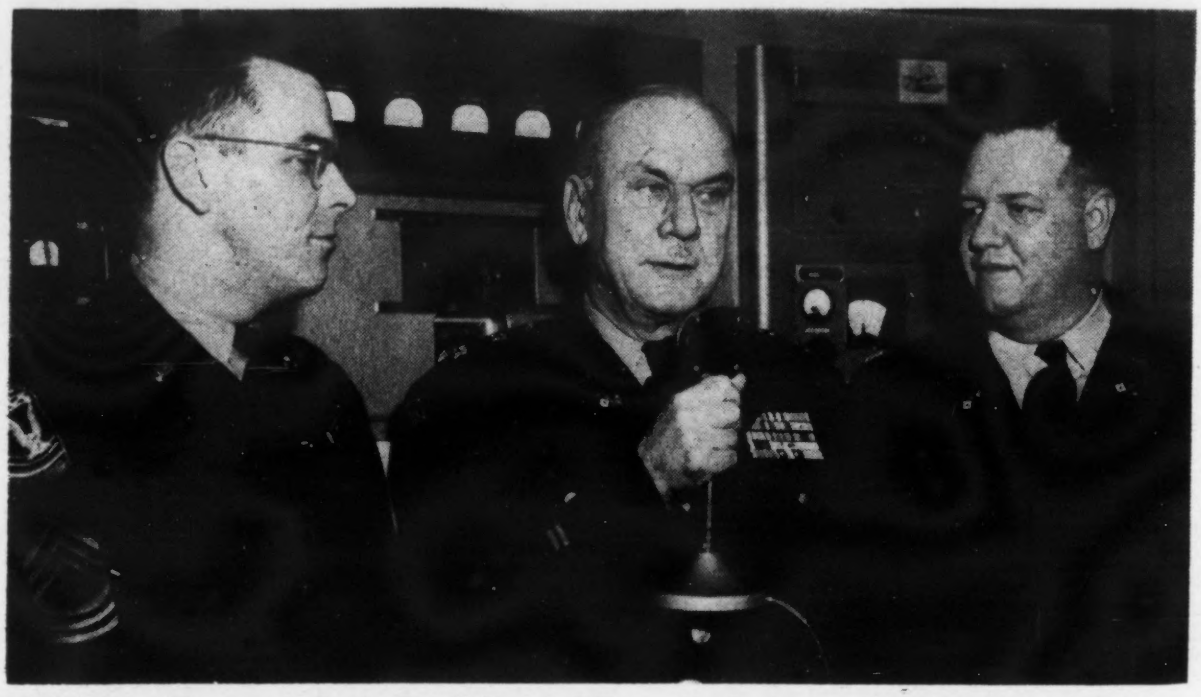
Expressing his gratitude for this "gift," General Sarnoff said it was only a matter of time, perhaps two years, before the finishing touches would bring this recording system to commercial reality. He described this RCA achievement as the first major step into an era of "electronic photography."

Such achievements as this, stemming from continuous pioneering in research and engineering, make "RCA" an emblem of quality, dependability and progress.

RADIO CORPORATION OF AMERICA

World leader in radio—first in television

Radio Military Amateurs



Major Gen. George I. Back, Chief Signal Officer, U. S. Army, participates in dedication of AA2USA via MARS from the Pentagon. Shown with General Back are M/Sgt. Oliver Goldsmith, Station Chief and Major James A. Long, Chief, MARS-Army.

Fort Monmouth Dedicates New Location for Mars Station AA2USA

MARS Station AA2USA has a new home. After many months of work on the part of personnel assigned to Fort Monmouth, New Jersey, AA2USA was officially opened at its new location on 19 March.

Included in the opening ceremonies was a special message from Major General George I. Back, Chief Signal Officer, U. S. Army, who addressed the group via MARS from the Pentagon in Washington, D. C. General Back in congratulating the assembled personnel at Fort Monmouth on a job well done said "this new facility which we are dedicating today constantly reminds us of the purpose of MARS and our duty to develop the skills of its members and to engage in the preparation of plans for use in case of local or national emergencies."

Present at Fort Monmouth were Major General Kirke B. Lawton, Commanding General, his staff and MARS members from the New Jersey Area.

MARS MOBILE UNIT PARTICIPATES IN INTERNATIONAL SHOW

The Military Affiliate Radio System is known throughout the world. That is the impression received from listening to comments at the International Sports-Travel and Vacation Show, Washington, D. C. this spring. Displayed at the show site in the National Guard Armory, Washington, the Headquarters Station Mobile Unit and an associated message center quickly proved to be one of the more popular attractions.

The mobile unit contains the latest in communications and amateur equipment. It is presently equipped for single sideband, amplitude modulation and radiotelegraph operation. Four transmitters and three receivers are included in the unit. Operation is possible on all MARS and amateur frequencies from 1800 kc to 30,000 kc. A 40 watt public address system is available for demonstrations before large gatherings.

MARS operators at the Exhibit

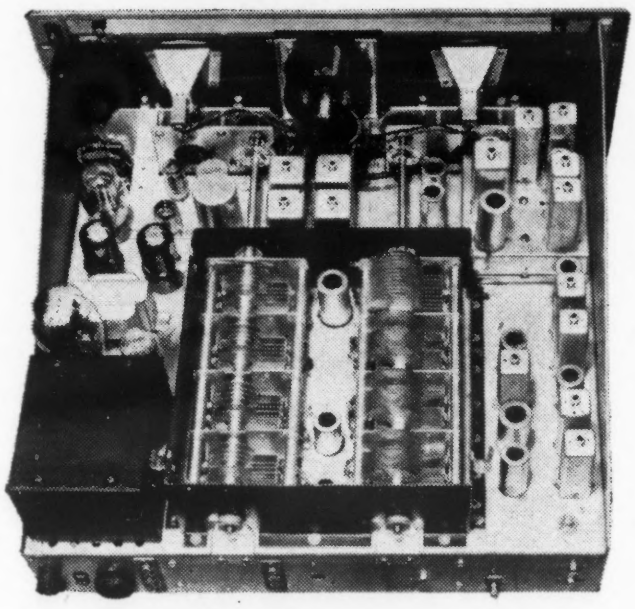
HERE ARE
31 REASONS
WHY THE

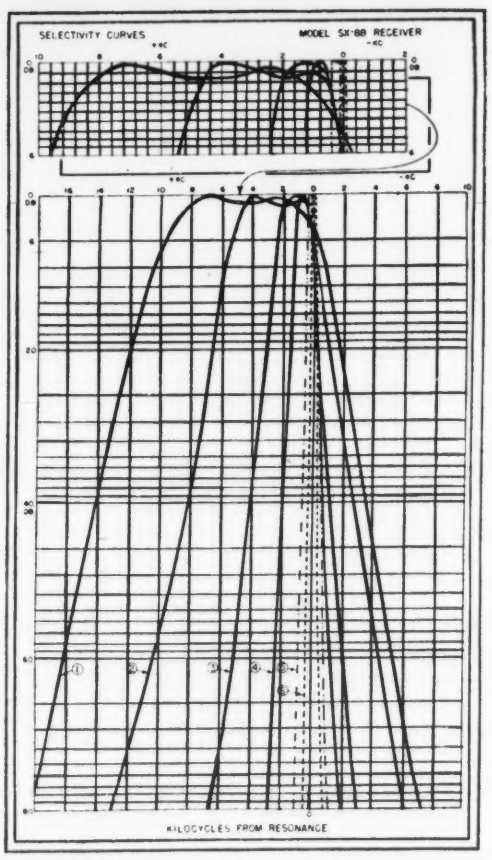
hallicrafters SX-88

is the hottest ham news in years!

SX-88

SELECTIVITY—
For the first time, selectivity from 10 kc to 250 cycles in six steps. Compare with ANY other receiver!





1. Heavy gauge steel welded chassis for mechanical stability.
2. Full precision gear drive for main and band spread tuning.
3. Six position Band Width Control (selectivity) from 250 cycles to 10 kc.
4. 10 watt inverse feed back and push-pull audio output.
5. Exhalted B.F.O. for tops in single side band reception.
6. Buffer amplifier in B.F.O. circuit.
7. Antenna trimmer.
8. Amplified and delayed A.V.C.
9. Built-in 100 kc calibration crystal.
10. Second conversion oscillators crystal controlled.
11. Inertia tuning (fly wheels both dials).
12. Full frequency coverage from 535 kc. to 33 mc.
13. Calibrated electrical band spread 160, 80, 40, 20, 15, 11, and 10 meters.
14. Logging scales on each tuning shaft.
15. Dial locks on each tuning shaft.
16. Tuning dial indicators resetable from front panel for maximum calibration accuracy.
17. Auxiliary A.C. socket on rear of chassis.
18. Illuminated band-in-use indicator.
19. Illuminated S meter.
20. Dual S meter calibration S units and microvolts.
21. Auxiliary power socket plus .6 amps at 6.3 volts and 10 ma at 150 volts for accessories.
22. Standard 8¾" by 19" panel for rack mounting if desired.
23. 50 kc i.f. output jack via cathode follower for teletype converter, etc.
24. Five position response control (tone control).
25. Two r.f. stages (Bands II to VI).
26. 17 tubes plus voltage regulator, ballast tube and rectifier.
27. Automatic noise limiter circuit.
28. Phono Jack.
29. Audio output transformer for 3.2, 8, 500/600 ohm loads.
30. Fuse for overload protection.
31. Auxiliary sensitivity control permits monitoring of local transmissions in standby position.

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answered questions from the public about the MARS program. Families and friends of service personnel were invited to send personal messages and greetings in the form of MARS radiograms to U. S. service personnel stationed throughout the world.

The International Show coincided with the annual Washington Cherry Blossom Festival Week. Thousands of visitors from across the nation and from foreign countries were in the capital city for the occasion. Opening day ceremonies at the International Show featured Secretary of Interior Douglas McKay, United States, and Ambassador Iguchi, Japan.

Shown above is the mobile radio unit for MARS (Army) Headquarters. This station contains high power and low power transmitters and three receivers. It pulls its own emergency power equipment in a special trailer. Two operators can operate from seperate positions simultaneously. The unit can be operated while the truck is in motion.

New Low-Priced Single-Sideband Filter for Amateurs

Burnell and Company, of Stamford, Connecticut, makers of toroidal coils and filters for commercial communications equipment and many other electronic applications, have announced a new single-sideband filter for amateur receivers.

Designated type S-15000, the new filter utilizes a toroid coil instead of the costly crystal filters formerly required, and is similar to the Burnell SSB filters which are widely used in commercial equipment. The S-15000 is the first low-priced, mass-produced SSB filter for "ham" receivers.

In addition to its low price, the Burnell S-15000 filter features compact size and ease of installation. Fixed-tuned and hermetically sealed, it requires no adjustment, is rugged and trouble-free. It may be installed in any existing amateur receiver now in use, and is suitable for incorporation into new designs by set manufacturers.

It is expected that this new filter will convert tens of thousands of "hams" to SSB reception, whereas the field up to now has been limited to a select few who had the time and money to tinker with it.

The S-15000 makes possible long-range reception with reduced interference and distortion, not only of SSB signals, but of any AM transmission. It utilizes 50 kc as a 2nd IF and provides a narrow-band, sharp cutoff response which insures maximum intelligibility and maximum signal intensity.

ARMED FORCES DAY 1954

The Army, Navy and Air Force again co-sponsored special amateur radio activities as a part of the observance of Armed Forces Day on 15 May 1954.

Special activities included a CW Receiving Competition, Military-to-Amateur Test and Radioteletypewriter Receiving Competition. Complete details of results will appear in the July-August issue of SIGNAL.

Classes for "Hams" Held in Newark

For the benefit of would-be "hams" wishing to qualify for Federal Communications Commission licenses, classes in radio theory and code have been instituted by the Hudson Radio and Television Corporation of Newark, New Jersey.

The classes will be held on Monday nights. The instructors are Joseph Prestia, W3RBJ, and Elliot Davis, K2CYZ, both amateurs of long experience.

Initial enrollment includes students from 12 to 60, several father-and-son teams, and one husband-and-wife combination.

The instruction, which is entirely free, lasts for two hours. It will run in ten-week cycles and will continue throughout the summer.

First Army Holds Mars Advisory Committee Meeting

On 27 March 1945 First Army MARS held its semi-annual meeting of the First Army MARS Advisory Committee. The meeting was called by Major Thomas W. MacClure, MARS Director, First Army. In attendance were the net control stations and representatives of military unit stations within the area.

PHOTOGRAPHY

Electrons and Photons - - A Photographic Review of the 1954 IRE National Convention

Wishing to view at first hand the impact of photography on the electronic arts, particularly television, your writer arrived at this, the largest of all conventions in the engineering world.

Held jointly at the Waldorf-Astoria, Hotel Shelton, and Kingsbridge Armory, the convention attracted some 40,000 visitors, the greatest attendance yet to be recorded.

With 604 exhibitors presenting acres and acres of equipment at their new location in the Bronx-Kingsbridge Armory, displaying the latest electronic apparatus and techniques, and photography too, the convention and exhibition should easily go down in history as one of the most successful ever attempted. However, it is not in this sum total of electronic equipments and devices that we are interested, rather it is that part that pertains to photography and its utilization by the electronic industries.

For this purpose, it is probably fitting that a list of a few of the many excellent technical papers bearing on the subject should be given.

During the meeting, altogether 243 technical papers were presented. Of these, about a dozen were found to be of direct interest, photographically speaking. Some of these papers, with short descriptive notes, were as follows:

Color and Enhanced Contrast X-Ray Images. R. S. Mackay, Univ. of California. Described two methods for bringing more information into an X-ray picture, one method of which consists of photographing the subject three times using different wavelength distributions each time; then making a color print from the resulting monochromes.

Color Film Scanner—Circuits. J. F. Fisher, Philco Corp. Described the electronic circuits used in the color-film-scanner.

Color Characteristics of a Television Film Scanner. J. H. Haines, Allen B. Du Mont Laboratories, Inc., Described the criteria for judging the picture quality of 16mm color film television reproduction.

Photographic Simulation of Proposed Brightness Modifications for Televising Color Film. J. H. Ladd and W. L. Brewer, Eastman Kodak Co. Discussed photographs designed to simulate the brightness scale reduction method described in an earlier paper on the subject. The photographs were viewed both directly and over TV systems and reactions to their appearance were described.

Feasibility and Technique of Storing Color Video Information on Black and White Film. W. L. Hughes, Iowa State College. Discussed the problems involved in producing a positive black and white film in which specular transmission is predetermined by both the spectral characteristics and brightness of the original scene to which the negative was exposed.

A System For Recording and Reproducing Television Signals. H. F. Olson, W. D. Houghton, A. R. Morgan, Joseph Zenel, Maurice Artzt, J. G. Woodward and J. T. Fischer, RCA Laboratories, Inc. Described a system which has been developed for recordings and reproducing TV picture signals both in black and white and color by means of magnetic tape.

"VTR"—A Magnetic "Videa" Tape Recorder. John T. Mullin, Bing Crosby Enterprises, Inc. Described a magnetic tape recorder for TV applications under development by Bing Crosby Enterprises, Inc. While operating only as a black and white recorder and reproducer at present, the system is applicable to NTSC color.

Optical Filters — Their Equivalence To and Difference From Electrical Networks. T. P. Cheatham, Jr., Harvard University. A survey of recent work in this field, including methods of synthesizing optical filters.

Facsimile Systems. A. S. Hill, Western Union Telegraph Co. Described the development of many types of facsimile machines, new features of operation and control, and recording papers needing no developing or other processing.

Operation of International Commercial Radiophoto Circuits. M. P. Rehm, RCA Communications, Inc. Traced the early experimental operations of R C A radiophoto from 1924 up to the present time, and described improvements and changes contemplated for the future.

Applications of Facsimile in the USAF. H. R. Johnson, Andrews AFB. This paper deals with the applications of wire and radio facsimile to specialized USAF needs.

Application of Cathode-Ray Tubes in Facsimile Systems. W. H. Bliss, R C A. Discussed the flying-spot cathode-ray tubes used in four different facsimile projects and treated briefly of recorders.

The Role of Stereo in "3-D" Radar Indicating Systems. W. R. Tower, Sperry Gyroscope Co. Surveyed the generalized methods heretofore in use. Present day methods and contemplated systems are set forth. Discussed examples of various optical arrangements and a typical stereo electronic circuit.

Visualization of The Distribution of Gamma Emitter In-Vivo by Camera and Image Amplifier. R. K. Mortimer, H. O. Aanger, and C. A. Tobias, Univ. of California. Described a gamma ray pinhole camera with image intensification for obtaining visual and photographic record of the distribution of radio-active isotopes administered to animal and human bodies in microcurie quantities.

So much for the technical papers. Now lets take a look at some of the acres of exhibits at Kingsbridge Armory and see what we can uncover in the way of photographic equipment and its applications to the electronic arts. As usual, General Precision Laboratories of Pleasantville, N. Y., was there with a full line of precision apparatus of a photographic nature mostly for use with or in conjunction with television. Speaking of television, it may be of interest to note that this firm is now featuring a deep sea television camera chain. One of these units is a handheld underwater TV camera of latest design.

Another line of equipment worth looking over was the broadcasting equipment of Gray Research and Development Co., Inc., of Manchester. Conn. This company features a full line of photographic equipment for broadcasting use. Among these

items may be mentioned their Telojector, a duo 2″ x 2″ slide projector for transmitting transparencies. Also may be mentioned the Telop (Television Opaque Projectors), projectors designed for broadcasting opaque cards, photographs, etc. Other items of this film include the 60A Multiplexer; the 13A Light Box; slide holders and other photographic accessories designed for TV use. Another item worth noting, although not strictly photographic, is the Infra Red Viewer Model 100A of the Capehart-Farnsworth Co., Fort Wayne, Indiana. This tube is designed primarily for extending the range of vision into the infra-red spectrum permitting observation of objects or scenes in the dark when used with an IR radiation source. The tube, however, can be used either with a TV or photographic camera for recording purposes. Another photographic item that should prove of interest to TV operators is the Multi-Scanner of Allen B. DuMont Laboratories, Clifton, N. J.

While this short review is by no means complete, it will serve to show in some small measure the vitally important part being played in electronics by photography.

FRANK SMITH

Ampro Introduces "Transistor" Motion Picture Projector

The first use of the transistor in a motion picture projector was announced recently by Ampro Corporation of Chicago. Employed in a "playback" projector, it is the latest development in the new field of magnetic recording on 16mm film.

The tiny transistor, no bigger than a dime in circumference, is built right into the projector, making possible the first single-case unit of its kind. Called the "477-R," it is primarily designed to play back film with magnetic sound tracks recorded by the film user. It can also project standard silent and optical-sound films.

The transistor, which gives full sound-range amplification, substitutes for a bulky transformer which would have necessitated separate housing in a unit remote from the projector itself in order to avoid magnetic noise pick-up.

The projector operates at both sound and silent speeds, with optical or magnetic sound tracks. It provides complete protection of the sound track because the film surface touches no stationary parts throughout the entire threading path.

As a special convenience to instructors and lecturers, a still picture button permits instant "freezing" of picture action for analysis and discussion. A film reversing switch enables the operator to back up film movement without stopping the projector.

NEW, EASY-TO-USE STEREO CAMERA ANNOUNCED BY KODAK

Culminating many months of design and engineering effort, the new Kodak Stereo Camera features extreme simplicity of operation and matched 35mm focal length Kodak Anaston Lenses, f/3.5. Both lenses are completely color corrected, coupled for dual focusing, and "Lumenized" with Kodak's extra hard surface coating to reduce internal reflections and increase light transmission.

The camera is also equipped with a new type Kodak shutter, with coupled blade action, having four speeds (from 1/25 to 1/200 second) plus provision for "Bulb" exposures. It features built-in flash synchronization, automatic cocking as the film is advanced, and double exposure prevention.

A unique feature of the new camera is a built in Exposure Calculator which, after the picture taker selects his desired shutter speed, automatically sets the proper lens opening for "bright," "hazy," or "cloudy-bright" lighting.

Another aid to simplified photography is incorporated in the camera's Distance Indicator which provides focusing points for "close-ups," "groups," and "scenes," in addition to the standard footage scale. These settings, together with the tremendous depth of field provided by the 35mm lenses, will give pleasing picture sharpness over a wide range.

The camera viewfinder is constructed so that the picture taker can see exactly what he will get in the stereo slide at all distances. A spirit level built in the camera viewfinder indicates when the camera is level—an important point in all stereo photography.

NEW DEVRY XENON LIGHT SOURCE

The DeVry Corporation of Chicago, Illinois has developed a new light source claimed to be five times brighter than conventional incandescent projection lamps.

The new source consists of a xenon gas, quartz-enclosed arc lamp designed to give intermittent fields of light to each frame of a motion picture as the film passes through the projector.

The film is synchronized so the pull-down on each frame occurs during the 4.5 msec. of darkness between each flash. The light therefore makes possible a shutterless motion picture projector and will also meet unusual demands for brightness levels such as are met in 3-D projection and color television.

Book of Interest

GRAPHIC GRAFLEX PHOTOGRAPHY. Willard D. Morgan, Henry M. Lester and 18 Contributors. 10th Edition. Morgan and Lester, Publishers, 101 Park Avenue, New York, N. Y. 432 pages, $6.00.

The present book is a new and completely revised edition of this well-known and perennial favorite on the subject of Graphic Graflex photography. Covering, as it does, all the important procedures of special value to users of the Speed Graphic, Graflex and other larger cameras of this type, it will be found of particular value to those whose field of specialization is in this category.

The result of years of experience, intensive research and personal contacts with thousands of photographers, *Graphic Graflex Photography* contains a wealth of information ranging from the elementary to the most advanced techniques for using these types of cameras. The book treats over 119 different subjects from choosing a lens and proper exposure through photography in crime detection, view camera techniques, infra-red emulsions, and color photography. On the subject of color photography, which is very ably treated by Ralph M. Evans, Director of The Color Technology Division of Eastman Kodak Co., the theme is an overall consideration of the subject as an expressive medium instead of mainly in terms of its technical aspects, as formerly. Sixteen pages of superb color pictures supplement the text on color.

The 432 pages of the present edition comprise 19 chapters, some of which may be truly classed as out-

standing. Among these may be mentioned the following: "Using a Lens" by Rudolf Kingslake; "Shutters and Synchronization" by Vernon E. Whitman; "Exposing The Negative" by John S. Carroll; "Using Filters" by John W. McFarlane; "View Camera Technique" by James G. Liccion; "Press Photography and Photo-Reporting" by Joseph Costa; "Photography In Crime Detection," by Dorothy S. Gelatt; "Photography In Industry" by George T. Eaton; and "Graflex and Graphic Equipment" by Henry M. Lester.

Of new and convenient format and size, extensively illustrated, well written, technically correct and readable, this new edition contains all the essential information required for most users of these larger cameras. For these, the book is recommended as a must.

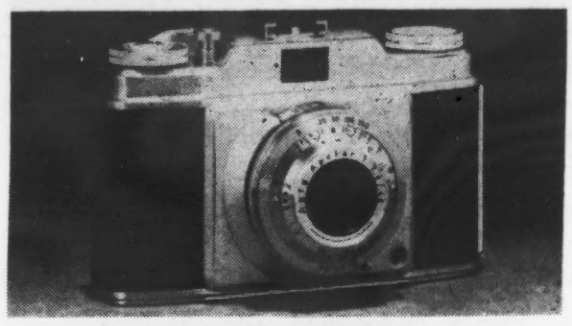
FRANK SMITH

FOUR NEW CAMERAS & CLOSE-UP DEVICE ANNOUNCED BY ANSCO

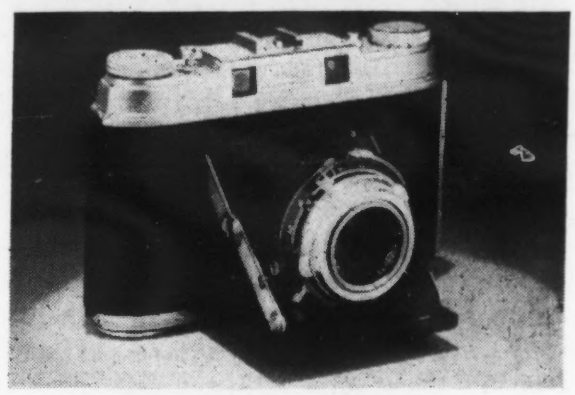
Ansco, Binghamton, N. Y., a Division of General Aniline & Film Corp., recently announced the addition of four new cameras to its already extensive camera line.

The camera that will probably be the star of the group is the radically new Anscoflex. It is a beautiful new two-tone gray and silver streamlined reflex conceived by the famed industrial designer, Raymond Loewy. A low-priced camera, it is aimed at the beginner photographer. The camera uses 620 roll film and gives 12 2¼ x 2¼ picture per roll. This camera has a flash shutter, double-exposure prevention device and an entirely new reciprocating action film transport knob which makes film winding as easy as winding a watch.

Other new Ansco cameras introduced include what is probably the lowest priced quality 35mm camera to be found anywhere in the world, the new Ansco Memar. This camera combines precision workmanship with simplicity of operation.



The Ansco Memar.



The Ansco Super Speedex.

One of the Memar's most interesting features is a new thumb-lever film transport which, in one motion, automatically sets the exposure counter, actuates the double-exposure preventer, advances the film and sets the shutter for the next picture.

This camera is for use with color and black-and-white film and flash, has a coated f3.5 anastigmat lens and all other features desirable in a 35mm camera.

The third new camera is the all-metal 35mm Ansco Super Regent, a high-grade miniature with lens-coupled rangefinder, new four-element f3.5 anastigmat lens, 1/500 second Synchro-Compur Shutter and various other quality miniature camera features.

The new Ansco Super Speedex f3.5 camera is the world's first *fully automatic loading* luxury folding camera. It offers convenience and safety features never before incorporated in a folding camera.

Close-up Accessory

A new accessory, the Karomat Proximeter for adapting the camera to close-up photography is now available. The Proximeter greatly simplifies the making of close-up pictures by permitting rangefinder focusing at extremely short subject distances.

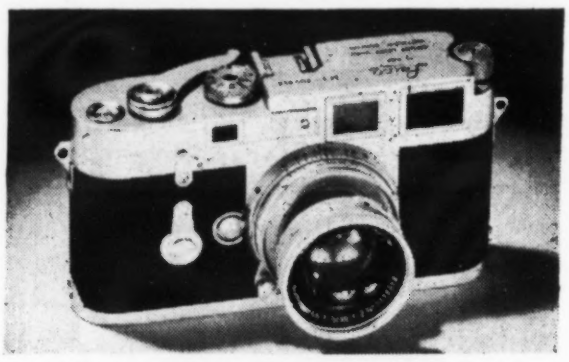
Two models of the Proximeter are available: Proximeter I and Proximeter II. Proximeter I allows rangefinder focusing and corrects the field of view for camera-to-subject distances of 19 to 40 inches. With Proximeter II, the working distances are 13 to 20 inches. Both Proximeters may be used together, at camera-to-subject distances of 10 to 13 inches.

LEICA INTRODUCES NEW MODEL

A new model, the M-3, has been recently introduced by E. Leitz, Inc. of New York.

The Leica features a single window for range and viewfinder, a quick change thread lock for rapid interchange of lenses, an automatic exposure counter and a built-in self-timer.

A new hinged back permits easier loading of the camera, and a built-in guide assures that the film will run parallel with the frame.



The new Leica M-3 model camera.

Catching Up with Government Specifications

(*Continued from page 29*)

Index, Volume IV." Volumes II, III and IV of the Index list the Federal and Military specifications approved for use by the particular departments. In addition, they list the individual bureau and service specifications still current which have not yet been included in the Federal or Military series.

All volumes of the military indexes may be purchased from the Superintendent of Documents. Prices are on a subscription basis and include a copy of the current basic semi-annual Index and five monthly supplements thereto.

Information regarding copies of specifications for use in connection with military procurements may be obtained from purchasing offices or inspector's offices. Copies of individual specifications used by the Army and the Air Force may be obtained as indicated in the foreward of the applicable volume of the Index.

Copies of specifications used by the Navy, and listed in Volume III of the Index, may be obtained upon application to the Commanding Officer, Naval Supply Depot, Scotia 3, New York .

Information regarding specifications issued by individual bureaus, services or activities in other than the Federal or Military series should be requested directly from the issuing activity.

Since Government specifications are continually being changed, it is the practice to furnish only the latest issue. Copies of superseded or cancelled specifications are issued only when specifically required by an invitation for bid or an existing contract. In such cases, where a specific issue of a specification is required, the request should so state.

Government activities know their needs in materials and equipment just as Industry knows the extent of production facilities, the latest developments in methods of manufacture and the sources and availability of materials. Specifications which represent the cooperative efforts of the two groups should insure equipment and materials of the required quality for Government use, yet which reflect all possible economies and advantages in production.

AIR FORCE GETS NEW "THUNDERFLASH" PHOTO FIGHTER

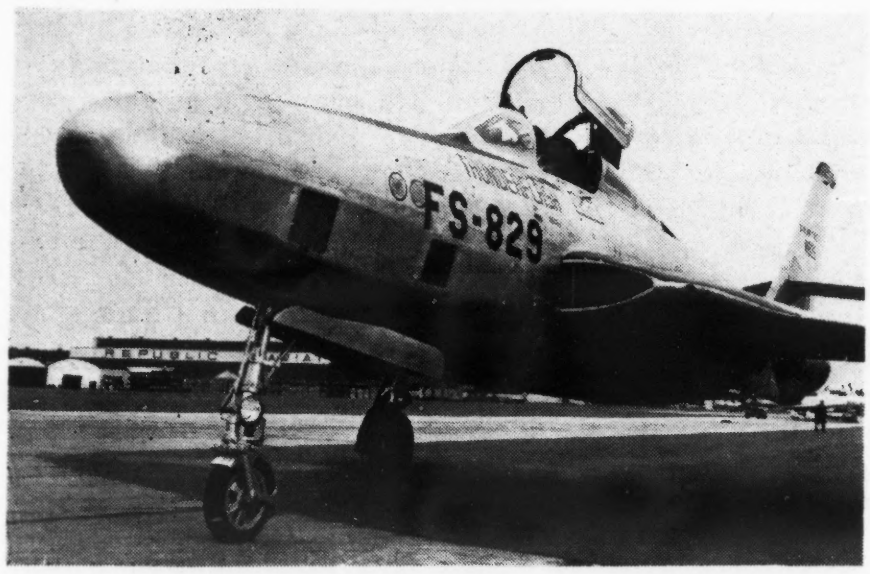
A swept-wing, single-jet airplane, the RF-84F, known as the "Thunderflash," has been developed recently by Republic Aviation Corporation for the U.S. Air Force.

This high-speed, photo-reconnaissance fighter is a "symbol twin" of Republic's F-84F Thunderstreak fighter-bomber, with the "R" signifying reconnaissance, but radical differences in appearance, construction and mission of the two planes prompted the Air Force to approve the new name and designation.

The Thunderflash—now entering volume production along with the Thunderstreak—has air-intake ducts located in the wing roots to permit installation of a sweeping variety of cameras in the nose. Its four .50 caliber machine guns for defense against enemy interceptors are mounted in the wings. No further details of performance or equipment are authorized for release.

The Thunderstreak has a single air-intake duct in the nose and mounts four of six .50 caliber machine guns in the same area.

The Thunderflash, like the Thunderstreak, far exceeds the performance of the Korean battle-tested straight-winged Thunderjet and was designed specifically to meet the Air Force's need for a super-fast fighter that can through sheer speed and maneuverability slash into enemy territory to obtain intelligence photographs. Ranking USAF combat generals repeatedly remarked on this need during the Korean war.



Pictured above is the first production model of the U. S. Air Force's high-speed Republic RF-84F photo-reconnaissance plane, officially known as the Thunderflash.

An important utilization of the Thunderflash was made known a few months ago with disclosure by the Air Force of "Project FICON."

In FICON, the Thunderflash teams with the giant RB-36 bomber in an aerial composite in which the bomber becomes an aircraft carrier of the sky. It launches and recovers the photo plane by means of a trapeze mechanism which extends from and retracts into the belly of the RB-36.

In this way the great speed of the Thunderflash, which has a range of its own of more than 2,000 miles, is given an assist by the 10,000-mile range of the bomber. The fighter is able to photograph almost any area in the world by riding the "mother plane" to the fringe of the target area, taking off on its own, and speeding back to the RB-36 for the journey home.

APPLIED ELECTRONICS, 2nd Edition. By Truman S. Gray. The Technology Press, Massachusetts Institute of Technology and John Wiley & Sons, Inc., New York, N. Y. 881 pages, $9.00.

The second edition of this classic work retains the purpose and much of the plan of the first edition. The major aims in the revision have been: to improve and clarify details; to bring the coverage up to date, and to include new developments such as the transistor and its applications.

The first part of the book is devoted to a discussion of the physical phenomena which form the foundation of electronics.

This material is followed by an explanation of the way the phenomena combine to govern the characteristics, ratings, and limitations of electronic devices.

The final chapters provide a treatment of the applications of electronics to the various branches of electrical engineering.

The author's emphasis on clarity and reasoning makes the book useful for independent study. He has been careful to provide all the links which the experienced engineer takes for granted but which may be easily overlooked by the student. In general, he places less emphasis on advanced mathematics than on a scrupulous attention to such thought-aids as the precise definition of symbols and their interpretation in terms of physical quantities.

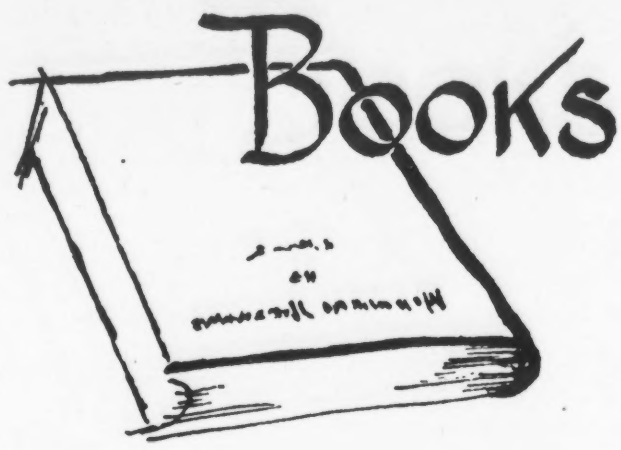
POWER OF WORDS. By Stuart Chase. Harcourt, Brace and Company, New York, N. Y. 308 pages, $3.95.

Challenged by the expansion and the new developments in the vital field of verbal communication, the author here reports to the intelligent layman, and clarifies the subject.

In an earlier book, *The Tyranny of Words,* Mr. Chase described how he studied semantics in order to improve his own communication as a writer. Besides semantics, Mr. Chase discusses in this new book other branches of communication, such as: cybernetics, linguistics, brain physiology, group dynamics, communication among animals, the perception experiments at Hanover and Princeton, and language development in children.

After describing the new findings, he applies them to various fields, including mass media, campaign oratory, Russian propaganda, economic talk, medical talk, and varieties of gobbledygook.

In his earlier books, Mr. Chase succeeded in making economic subjects interesting and clear to the average intelligent reader. Since then



he has turned to broader aspects of social science, reporting and trying to integrate diverse specialties, so that not only the general reader, but the experts may better understand what is going on. This volume is another skillful example of integration in the sciences dealing with human relations.

FATIGUE OF METALS. By Roger Cazaud, translated by A. J. Fenner. Philosophical Library, Inc., New York, N. Y. 334 pages, $12.50.

The extent of the literature on the characteristics and behavior of metals, when subjected to cyclic stresses, is so great as to present a real difficulty even to those engineers and scientists who must keep themselves closely informed of progress in this field.

Fatigue of Metals is a comprehensive survey of the subject, prepared by one who has made extensive personal research contributions to current knowledge. Dr. Cazaud, well known and highly esteemed in research circles, is regarded as a leading authority in the metals field.

Practically half of this book is concerned with the inherent resistances of metals and alloys as developed under laboratory test conditions. The remainder of the book is devoted to the vitally important practical aspect of the prevention of fatigue failure.

In this book, the author has given us an extensive, lucid and up-to-date review of fact and practice, which, if thoughtfully applied, should be most helpful towards the improvement of design, and the use of more suitable workshop methods and finishes.

HOW TO TAKE BETTER PHOTOGRAPHS. Edited by Betty M. Kanameishi. Popular Mechanics Press, Chicago, Ill. 160 pages, $2.50.

The need for a good all-around handbook on basic photography has long been felt in the photographic world. Because of this, *How to Take Better Photographs* by the Editors of Popular Mechanics has been conceived.

In *How to Take Better Photographs,* the reader first is taken through the initial steps of this hobby and vocation. The latest camera equipment is discussed, then picture-taking techniques — what to know about exposure, lighting, composition and special effects. There is an excellent chapter on "Darkroom Know-How" giving step-by-step instruction for setting up the darkroom. developing the film, processing the prints, toning and other special techniques.

There are well over 200 excellent photographs, with a full explanation of how each was taken and finished. This book, whether in the hands of the professional or amateur, will open new ideas, methods and fields of interest in photography.

RADIO RECEIVER DESIGN. Part I, 2nd Edition. By K. R. Sturley. John Wiley & Sons, Inc., New York, N. Y. 667 pages, $10.00.

This book is an attempt to bring together the fundamentals of radio receiver design.

Time has not revealed the need for a change in the main lines of presentation so this revision has been concerned mostly with improving the clarity of some sections and with the inclusion of new material.

Chapter 1 has been completely rewritten with emphasis on the fundamentals of transmission and reception. Attention is paid to noise factor, which is now recognized as a useful and important criterion of receiver performance.

The main change in Chapter 2 is the addition of a section on valve noise, its calculation and measurement. Wavetraps, signal-to-noise ratio, and balance-to-unbalance aerial feeder connections represent some of the new material in Chapter 3.

Chapter 4 gives additional information on self-capacitance and mutual inductance of coils. Little alteration has been made to the next chapter apart from new sections on the diode frequency changer, noise and the Synchrodyne.

In chapter 7 a good deal of space is devoted to new material on crystal coupled i.f. transformers.

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Civil War Signals

(*Continued from page 33*)

did not control the telegraph lines and operators. General Grant tested Stanton's authority several times, once forcing a civilian telegrapher to hand over the code to one of his staff officers. But Stanton soon compelled Grant to hand it back.

The Military telegraph, under Secretary Stanton the Autocrat, has been described as the "perfect autocracy." One historian termed his control of telegraph as "peculiarly autocratic and independent." Not allowing his telegraphers to be attached to any military command, Stanton made them answerable to himself only and he saw to it above all that the safety of the code was insured. And it was. The Military Telegraph code was uncompromised and secure throughout the war. Further, of course, this sort of control, all telegraph lines ultimately terminating in the War Department telegraph office next to Stanton's own rooms, put the Secretary of War at the very pinnacle of intelligence and surveyance. No wonder Stanton thought highly of his telegraph and described it as "his right arm watching and guarding his armies everywhere, night and day, and keeping constantly before his eyes a perfect but ever changing panorama of the vast battlefield of the Union."

But the stripping away of wire telegraph, including the Beardslee sets, was a shock to the Signal Corps. Myer regarded the act as crippling army signals in the field. In subsequent campaigns there often were two communication agencies in the Union army. There were the Signal Corps flag and torch wigwag men with their visual stations, and there were the lines of the Military Telegraph people. In some campaigns, too, there was the Signal Corps only, and no kind of wire telegraph.

Myer did not doubt the place of the civilian telegraph in what we would now call the Zone of the Interior, but civilian telegraph with the fighting troops was another matter. It was wrong for the civilians to suffer the hardships and dangers of war without the compensations soldiers receive. And it was a wrong to the officers and men of the Signal Corps. Subsequent practice has proven that Myer was right. Field telegraph, field communications, are of course an army obligation, not civilian. General Greely, most renowned of Chief Signal Officers, wrote years later: "beneficial and desirable as were the civil cooperation and management of the telegraph service in Washington, its forced expansion to armies in the field was a mistaken policy."

After Myer's departure in November, 1863 (to return as the Chief Signal Officer in the post-war period), Major Nicodemus headed a somewhat shorn, yet still vigorous Signal Corps. The Corps remained vigorous even when Nicodemus, like Myer before him, fell under Stanton's potent displeasure late in 1864, because he had distributed to his officers in the field his annual report without clearing it with the Secretary of War. The order dismissing Nicodemus charged that the report contained "information useful to the enemy and prejudicial to the service of the United States." Stanton further sent men and an officer to the signal bureau to seize the press and every copy of the report. Such action makes it appear possible that code or cipher information may have been involved. If so, it points up Stanton's emphasis on security, which may have been a major factor in the Secretary's autocratic control of the Military Telegraph. Nicodemus, incidentally, was returned to the Signal Corps in March 1865 with the rank of lieutenant colonel and was honorably mustered out of service the following August.

After the dismissal of Nicodemus in November 1864, Colonel Benjamin F. Fisher acted as the Chief Signal Officer for the remainder of the Civil War. Signal flag and torch, Myer's aerial telegraph, continued to distinguish themselves in innumerable campaigns. The system was used not only on land but on ships as well, in the combined land and water operations along the southern coasts and waterways. In fact, the Navy during the war adopted the army's signal system.

The apathy and disinterest which signals early encountered gradually yielded to general acceptance. A Union officer had said on one occasion "Oh the telegraph will do. We can't bother with these balloons and whirligig flags, and colored lamps and fourth-of-July fireworks!" But he was thoroughly refuted. Colored light signals were part of the Signal Corps indispensable equipment. On one occasion at the siege of Knoxville roman candles which had been intended for signaling were put to use to illuminate a night attack, in the manner of star shells of subsequent wars, enabling the defenders to mow down the Confederates before they reached the breastworks.

And the effort to adapt the telegraph to field needs, the first gropings toward what later became tactical army communications, led to the Beardslee magneto-electric telegraph instrument. This deserves especial notice because it was the very first electrical device designed and built specifically for army signals. The concept of the field telegraph train grew from Albert Myer's determination to serve the army with a Signal Corps equipped with all possible communication aids.

Thanks to General Myer and the Military Telegraph during the Civil War, both the Union Army and the Federal Government enjoyed communications on a scale surpassing that of any previous conflict.

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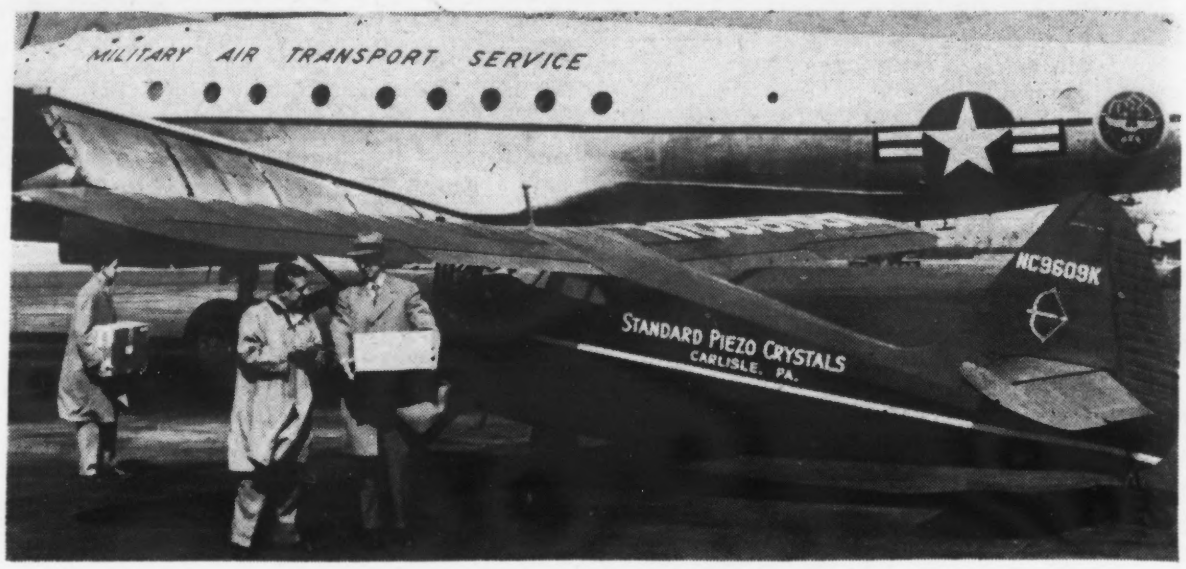
Rush Order to Indo-China

A "rush order" of crystals for use in Indo-China by the French was received by the Stanard Piezo Company of Carlisle, Pa., during April.

As soon as the crystals came off the production line and were tested, Joseph A. Diblin of Standard Piezo rushed them to Washington National Airport where they were turned over to T. O. Dunwody, of the French Embassy.

The photograph on the right shows Fred Smith (left) and Mr. Diblin (center) of Standard Piezo delivering the crystals to Mr. Dunwody.



Research and the Electronics Industry

(*Continued from page 23*)

scale. The new material, which may be formed into shapes by hot pressing the powder, is being evaluated commercially for numerous electronic applications, such as tube spacers, tube windows, etc.

The synthetic mica-ceramics have low water absorption characteristics, good high-temperature stability up to 1500°F., good vacuum properties, and the dielectric properties are as good, if not better, than most other ceramic materials. As electrical insulators, they are comparable with fused silica and ultra low-loss steatite.

An important advantage of the synthetic mica-ceramics is their ready machineability. Since machining is the final operation, the mica can be machined to exact size and no shrinkage corrections are necessary.

* * *

You are aware that germanium and silicon are the semiconductor materials utilized in present day transistors and certain types of rectifiers. It is well known, and of particular concern to the military services, that germanium loses its transistor properties at temperatures slightly in excess of 100°C. Silicon, on the other hand, does not do this until a much higher temperature is reached. To date, however, silicon has posed a difficult material problem in the fabrication of transistors. It has the additional limitation of low-charge mobilities, which limits the frequency range. Solid-state physicists have tantalized those of us who administer research with the possibility that inter-metallic compounds or alloys may be developed which combine high-charge carrier-mobilities and high intrinsic temperatures. Even if this Utopian state cannot be reached soon, it is certain that when the metallurgists can furnish the compounds in sufficient purity, transistors and similar electronic devices can be tailor-made for specific applications. . .

The transistor is only a single example of the many electronic devices of great importance which will undoubtedly come from basic research in solid-state physics. . .

Of more than casual importance in the field of powder metallurgy is the appearance of a class of new materials called "ferrites". These are metallic oxides, having a "spinel" structure. These substances are characterized by the unusual properties of high resistivity and ferro-magnetic permeabilities at the same time. By magnetizing these "ferrites" with controlled direct-current fields, it is possible to exploit them in a variety of devices in microwave circuits.

The "Faraday effect" has long been known in optical experiments. This effect is characterized by the change in polarization of a plane-polarized light beam when passing through a magnetic field. The direction of rotation was found to depend only on the direction of the applied magnetic field. To an observer looking along the direction of the magnetic field, the sense of rotation of a plane polarized light-beam turns out to be the same whether the wave is traveling toward or away from the observer. The same effects are now known to occur in the case of microwave radiation. It is necessary, however, that the magnetic field causing the rotation be impressed on some substance such as a ferrite material before effects of any significant magnitude are noticed. . . Applications of this phenomena have already brought forth a large family of new devices, such as microwave switches, isolation buffers, phase modulators and shifters, and antenna-scanning controllers. Our knowledge of ferrites is quite new, and there remains much to be learned about their characteristics and uses.

* * *

In recent years the severe congestion of services in the radio frequency spectrum has been an increasingly serious problem. Fortunately, the problem itself has supplied the impetus to the development of new techniques and methods of communication. Research, both theoretical and experimental, in tropospheric propagation is rapidly accelerating. Present indications are that with sufficiently high power, reliable point-to-point communications at distances of several hundred miles will be possible at VHF and microwave frequencies. Coupled with recent developments in high-power microwave tubes and in the millimeter-wave band, this new mode of propagation should eventually ease the crowding of the frequency spectrum.

Another tool which has recently come to our aid in making more efficient use of the radio spectrum is the theory of information, or communication theory as it is called in England and Europe. This theory has already been useful in determining just how closely the present-day methods of modulation approach the ultimate rate at which information can be transmitted over a communication channel. General theories of this sort enable us to understand where we want to go in communications research and how to get there.

Conservation of band width, as we know now, can be accomplished by utilizing more efficient coding procedures. Information theory has been of inestimable value in helping us devise such procedures. Perhaps more important, information theory should soon help us establish the link between the properties of the human brain and the structure of the language, all of which is ultimately tied to the problem of communication. Here we have a perfect example of how a purely fundamental mathematical approach to research has led to highly practical results.

Considered Reconversion or Cankerous Recession, WHICH?

(*Continued from page* 14)

War II while outstanding consumer credit expressed as a percentage of disposable personal income may be two and one-half times greater or more.

The rate of expansion of our dynamic economy may decrease or a decline set-in unless prices are rolled back, wages increased or credit restrictions eased.

Easing and tightening credit restrictions may prove an invaluable indirect economic stabilization control.

Now assume reconversion to be from a protracted period of austere civilian economy, crusts of bread only, no butter. Here again, as after a World War II, the chief problem is for an accurate forecast of supply against actual consumer needs, not just supply and expected demand.

If the supply of specific material remains either critical or uncertain, it may be necessary to retain selective material controls. Price, wage and other financial controls, direct or indirect, especially consumer credit, pertaining to end products containing those critical materials may be needed to complement the material controls. However, it should be conceded that there is appreciable merit in the argument that these sister controls should be exercised only over materials up to and including processing into forms usable by most manufacturers.

Some businessmen believe any arbitrary price setting, no matter how sound the assumption on which based, would be unsuccessful. They believe that competition can set fair prices in business, on the "trade association" level if working in accordance with a broad master plan put forth by Government. Such a plan should have been developed in the pre-emergency stage and procedures roughed out during the emergency, final touches being put on when strategic victory is in sight.

Labor may successfully resist wage ceilings in the post-emergency period. It has in the past.

Neither arbitrary prices nor wage ceilings can be expected to relieve all the strains and warpings of incentives inseparable from a shortage market. A flexible monetary and fiscal policy, including consumer credit, might. A proper monetary and fiscal policy should have economic stability as its primary objective. This is one thread of thought appearing and reappearing throughout this paper.

Certain other threads of thought are woven through the foregoing discussion of three economic situations, two of which are not too dissimilar. These threads are:

A. As emergency spending declines in the intra or post emergency period, the total volume of consumer spending for goods and services should rise if our economy is to remain dynamic.

B. As a backlog of savings may not be available, management and labor together should plan for and bring about accelerated expansion of peacetime industry under agreeable safeguards fairly thought out by Government.

C. New products to fill new wants, pridefully produced. marketed under indirect controls with intelligent consideration of the consumer seems a sensible way to snub any decline.

D. Forethought will do more toward saving capitalism than hindsight whether the situation be one of recovery from a World War III or cold war.

At the outset of this paper it was stated that its purpose was to discuss a reconversion that would not degenerate into a recognizable depression. If plans are made for reconversion and if those plans are deliberately designed for flexibility in execution, part of the battle is won. Planning of certain measures such as expanding industry and control policies was mentioned. The onus of planning was deliberately placed on responsible people outside of Government. It was pointed out that both amplitude and frequency of the economic cycle should be constrained if at all possible.

The United States must demonstrate conclusively that capitalism does the most good for more people than any other economic system. Otherwise our country cannot remain a pillar of strength in the free world.

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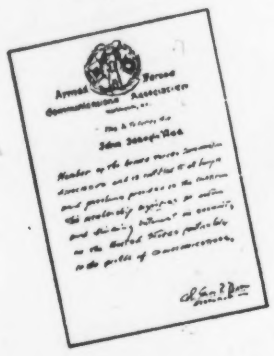

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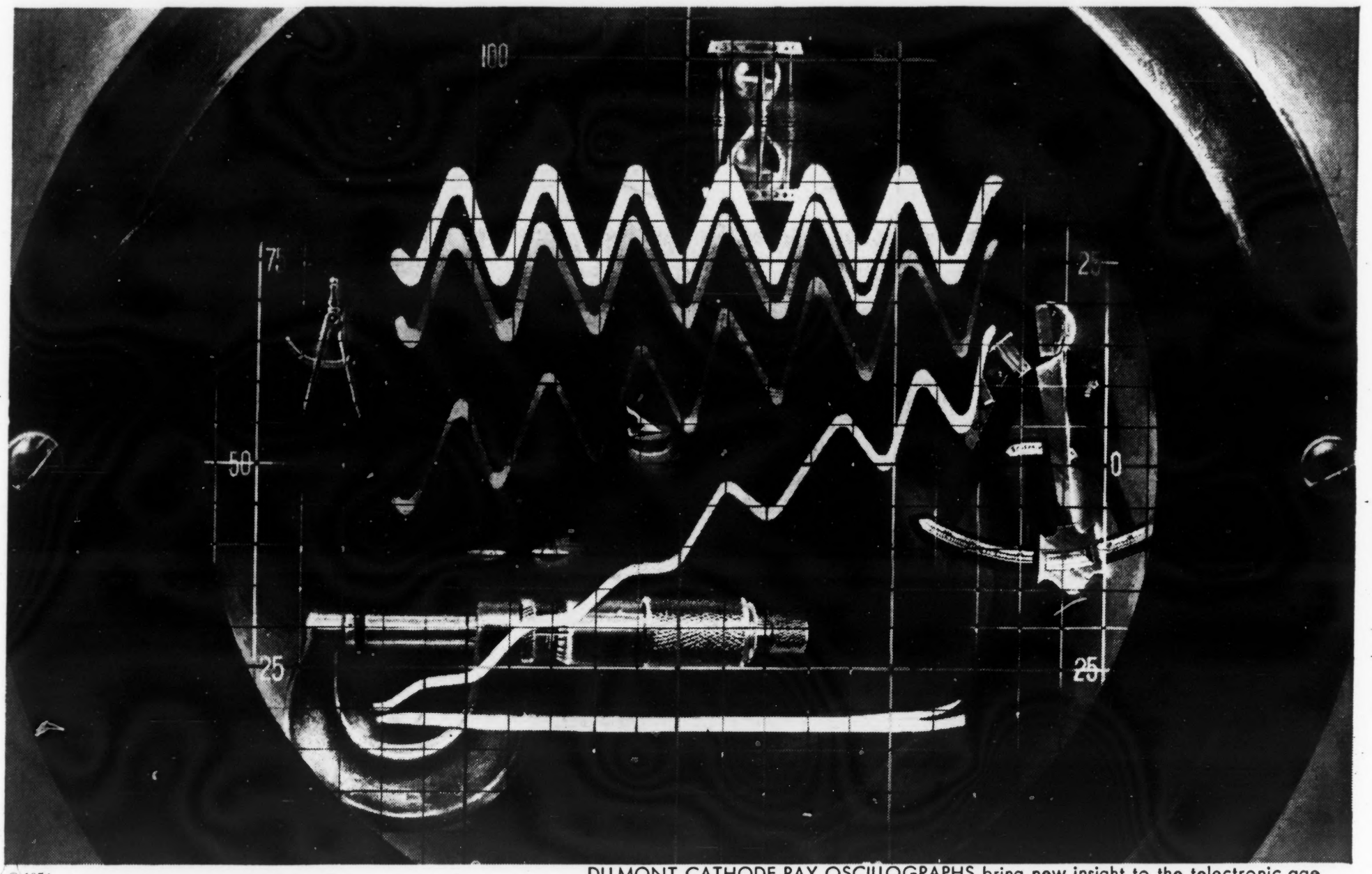

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